The Welding Engineer
JUNE, 1945
THE PIONEER TECHNICAL PUBLICATION OF THE WELDING INDUSTRY

There's Economy in the Long Run

They are lighter . . . faster . . . safer. Ocean ships and railroad trains are but a few of many things redesigned for modern demands. Our trains travel faster and farther on less fuel. Our planes are winning the war because of this.

Jackson's Featherlight A-4W Holder is another instance of this general trend. It is based on the time-tested principle of tong-type operation and it is fully insulated for safety. Its light metal parts eliminate dead weight. Its streamlined design, its smaller size, its increased lever length all add up to operator appeal and get the job done faster and with less fatigue. And that's what we mean by saying *"There's Economy in the Long Run"*.

QUALITY JACKSON PRODUCTS

Jackson's Featherlight A-4W

A Post-War Product for Wartime Use

- FEATHERLIGHT: 50% weight reduction.
- TONGS are of tough light weight alloy.
- COPPER JAWS, quickly and easily replaceable.
- INSULATORS: New Crown Type last longer.
- MAINTENANCE: Replaceable Copper Jaws and Crown Type insulators cut maintenance 50%.
- VENTILATION: Free flowing . . . no holder works cooler.
- NEW TONG PIVOT-HINGE: Easily knocked down and assembled.
- CABLE CONNECTIONS: Mechanical.
- CAPACITY: ¼" electrodes.

JACKSON PRODUCTS

3265 Wight Street, Detroit 7, Michigan

Designers and manufacturers of fully and semi-insulated electrode holders for every arc welding need, including "Quik-Trik" models TA-1 and 3, with easily detached cable end and the "Quik-Trik" Cable Connector. Complete illustrated folder upon request.

Contact your nearest Jackson dealer or write to us.

In Canada: Hollup Corporation Limited, Toronto
Paragon Supplies Limited, Vancouver

Westinghouse AP Electrodes—For high-speed, highest quality welds in all positions with d-c reverse polarity. Meet AWS and ASTM Specs. E-6010.

5 electrodes

ARE ALL YOU NEED!

That's all you need for any type of mild steel welding. You can reduce your electrode stocks and still have the right electrode ready and available for every job.

Each of these five Westinghouse electrodes will help speed your production and assure sound welds. Slag is light and porous. Removal is quick and easy by light brushing. You'll get good flat beads, too—beads that stay put. And no matter what the position may be—downhand, vertical or overhead—arc control is easy.

Why stock more when five electrodes are all you need? For complete information on each of these five quality welding electrodes, write today for your copy of SA-740-A. Westinghouse Electric & Manufacturing Co., P.O. Box 868, Pittsburgh 30, Pa. J-21336

Westinghouse ACP Electrodes—For high-quality welds on work that is not easily positioned; a-c and d-c reverse polarity. Meet AWS and ASTM Specs. E-6011-10.

Westinghouse FP Electrodes—A high-speed, general-purpose electrode—for all types of structural steel welding. Meet AWS and ASTM Specs. E-6013-12.

Westinghouse SW Electrodes—For low-current, all-position welding. Especially effective on light sections—working up or down on vertical fillets. Meet AWS and ASTM Specs. E-6013-12.

Westinghouse DH Electrodes—For high-current, a-c or d-c, flat, horizontal fillet or deep-groove, multi-pass welding. Meet AWS and ASTM Specs. E-6030-20.

Westinghouse

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

FLEXARC ELECTRODES

The Welding Engineer

Welding • Cutting • Brazing • Flame-Treating • Metallizing
Design • Construction • Production • Inspection • Maintenance

ABP MEMBER ABC

Associated Business Papers
Audit Bureau of Circulations
American Welding Society
International Acetylene Association

G. H. MACKENZIE
President and Treasurer

T. B. JEFFERSON
Editor

CLYDE B. CLASON
Associate Editor

ROBERT L. SIMON
Promotion Manager

» «

Eastern Representative:
T. E. DEPEW, 1819 Broadway
New York 23, N. Y.
Tel. Circle 7-1291

Midwest Representative:
D. R. WATSON, 400 W. Madison St.,
Chicago 6, Tel. Andover 5481

Pacific Representative:
W. R. McINTYRE, 832 W. 5th St.
Los Angeles 13. Tel. Mutual 6306

» «

Published on the 10th of each month by The Welding Engineer Publishing Co., 506 So. Wabash Ave., Chicago 5. Phone Webster 7134.

Copyright, 1945, by The Welding Engineer Publishing Co.

Subscription, United States, possessions, and Canada, $3 a year; foreign countries, $4 a year; single copy, 35 cents. Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

FOREIGN REPRESENTATIVES: AUSTRALIA and NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand; BRAZIL—Alpha Jewel, Caixa Postal No. 2411, Rio de Janeiro, Brazil; GREAT BRITAIN—A. D. Baynes, 1 Cambridge Park Court, Twickenham, Middlesex, England; SOUTH AFRICA—J. W. Arnison, 35a Victoria Avenue, Benoni, Transvaal, South Africa; U. S. S. R.—Mesdunarodnaja Kniga-Kusnezki Most 18, Moscow, U. S. S. R.

VOL. XXX, NO. 6 JUNE, 1945

IN THIS ISSUE

ARTICLES

Welded Hydraulic Presses 39
CLYDE B. CLASON

An Analysis of Hard-Facing 44
FRED M. BURT

Welding for the Armed Forces 48
R. G. ALISON

All-Welded Invasion Barges 51
WILLIAM A. SPRINGER

Welded Handling Equipment—II 54
WALTER J. BROOKING

Power Systems for Resistance Welding 57
J. H. COOPER

Welded Bombs for Insects 75

Editorial 37

On the Job 64

Short Cuts and Kinks 68

Engineering Data Sheet No. 57 73

New Products to Use 78

Helpful Literature Just Published 92

News of the Industry 98

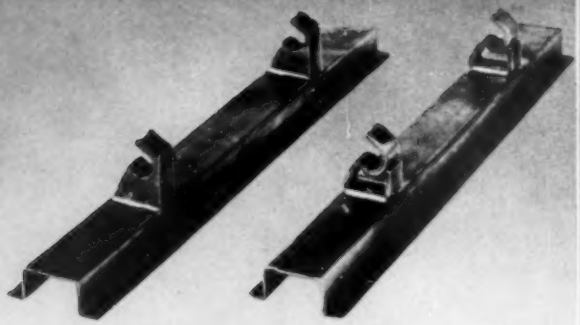
About People 104

From the Patent Office 110

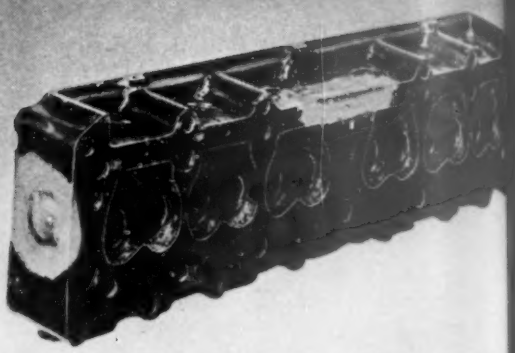
Classified 119

Index to Advertisers 120

AVOID WELDING DISTORTION



Arc welding bombsight hanger on frame member of plane produced severe warping and misalignment. Eutectic Low Temperature Welding prevented distortion and formed strong joints.



Cast iron motor heads are safely repaired without danger of subjecting to stresses, eliminating need for costly and lengthy after machining always necessary to correct distortions.

WITH EUTECTIC *Low Temperature* WELDING RODS

EUTECTIC (Pronounced U-tec-tic) Reg. U.S. Pat. Off.

Every day—there are jobs that can be done *better* the EUTECTIC way. *Try it today!*

Castolin Eutectic

The Welding Engineer

AMERICA'S PIONEER WELDING JOURNAL

Established 1916

What about Distributors?

The question is sometimes asked: "Why should I buy from my welding equipment distributor?" This query is then backed up by some rhetoric as "He hasn't been able to take care of my needs," or "Besides, I can do better by buying direct."

Can you do better by buying direct? Let's make a brief survey of the facts.

The manufacturers who have a sound jobber policy also have a plan for protecting their distributors. Instead of doing better when you buy direct, you often become a loser. These manufacturers will share a part of every dollar you spend with them with their distributor (his regular commission) just as though the distributor had made the sale himself. *He* is the lucky one when you buy direct because he incurs little or no sales expense and will miss the servicing headaches.

What have *you* got out of it? When stuck with a knotty problem, it is often nice to be able to turn to someone close at hand for service or application information. Of course the distributor cannot always answer all your questions, but in most instances he will bend over backwards to try to get the correct answer for you. And because of his diversified experience the answer is usually readily found. Why sacrifice this free service?

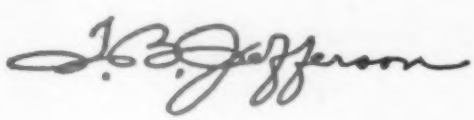
Now comes the further argument: "The XYZ Company doesn't sell through distributors." Perhaps not, but if not then it must have sales engineers to supply the functions of jobbers or distributors in specified territories. This service has to be paid for too, and that is reflected in the prices. If a manufacturer has neither distributors nor sales representatives, it would seem the better part of wisdom to try him out very cautiously before making any substantial purchases. Get honest answers to these questions:

Is the company so new that it has not had time to set up distribution outlets? Is its production so small that only a limited territory can be served? If neither of these is true, why is widespread distribution not a company goal? Has it been possible for this producer to locate reliable distributors or sales representatives who will handle its welding equipment? Why not?

Think it over. Maybe your distributor didn't serve you in the way you wanted to be served during the war years. It is quite possible, however, that he didn't want to treat you the way he did. Look into the real reason. Were your priority ratings good? How was his stock? Was it pure cussedness that kept him from meeting your requirements, or could he have met them without avoidance of prior obligations? In this connection, how well did the manufacturer serve you when you ordered direct? Most reports indicate that the distributor has delivered better service to his customers than the manufacturer.

Sure, there are some jobbers who act "high-handed" and "independent." Every line of business has a few members who think this war is going to last forever. But you cannot condemn everyone for the offensive acts of a few—if this were possible, you too might have to face unpleasant consequences.

Despite the various arguments presented, for every reason offered you for not buying from a welding distributor there are easily a dozen reasons why you should. Your local welding distributor is in business to serve you, and as long as such service is being rendered he deserves your wholehearted support.



How I tipped Smitty off to the new Murex HTS

SMITTY, our arc-welding super, let out a roar that must have carried clear up to the Front Office, waking up half our Brass Hats.

"I'm the boy," he squawked tragically, "that everything happens to! Kindly look at that assembly, Miss Davis."

I kindly looked at the assembly. It was a part he'd just welded. It had cracked.

"It's busted," I said brightly.

"You're —— right it's busted!" Smitty yelled, forgetting I'm just a lady welder, and not a night club babe who is used to such fascinating language. "And I'd like to bust the guy that thought this steel could be welded in the first place. Now what do I do?"

"Being new around here," I said calmly, "I wouldn't know. But I can tell you what the arc-welding super I used to work for did whenever he got in a jam. He put in a hurry call to Metal & Thermit, who make about thirty electrodes they call Murex, and a Murex man would come on the run with the answer."

Smitty began to flare up, the way men usually do when they ask your advice and you give it. But one more look at the cracked welds cooled him off. He called Metal & Thermit.

The Murex man was out the next day with something he called the new Murex HTS or High Tensile Steel rod. In a jiffy he had on welding gloves and a helmet and was making welds without cracks or porosity.

"*This new Murex HTS,*" I heard him tell Smitty, "*was designed to fill a definite need. Because of its moderate penetration and low pick-up of alloys it is an ideal rod for use on many hard-to-weld steels, particularly those of the high carbon and high sulphur types. And it's an all position rod that can be used on lots of jobs where we used to have to weld with stainless steel.*"

The upshot was that Smitty ordered 3000 pounds of the new Murex HTS on the spot. And when I left for the day, he and the Murex man still had their heads together over the new Murex Wall Chart, which gives all the data on Murex's thirty-odd electrodes. I advise you to write for one to tack up in your department. And to save a lot of excitement and agony when some new arc-welding problem comes up, tip your boss off to call or drop a line to:

METAL & THERMIT CORPORATION
120 BROADWAY, NEW YORK 5, N. Y.
ALBANY • CHICAGO • PITTSBURGH • SO. SAN FRANCISCO • TORONTO

We sort of dreamed up Miss Davis. But Smitty's problem was only too real: it involved Speedcase steel analyzing .20 carbon, 1.25 manganese, .02 phosphorous, .03 silicon and .25 sulphur. The new Murex HTS rod solved it for him—and is solving lots of other arc-welding problems under conditions mentioned in italics above.

MUREX Electrodes

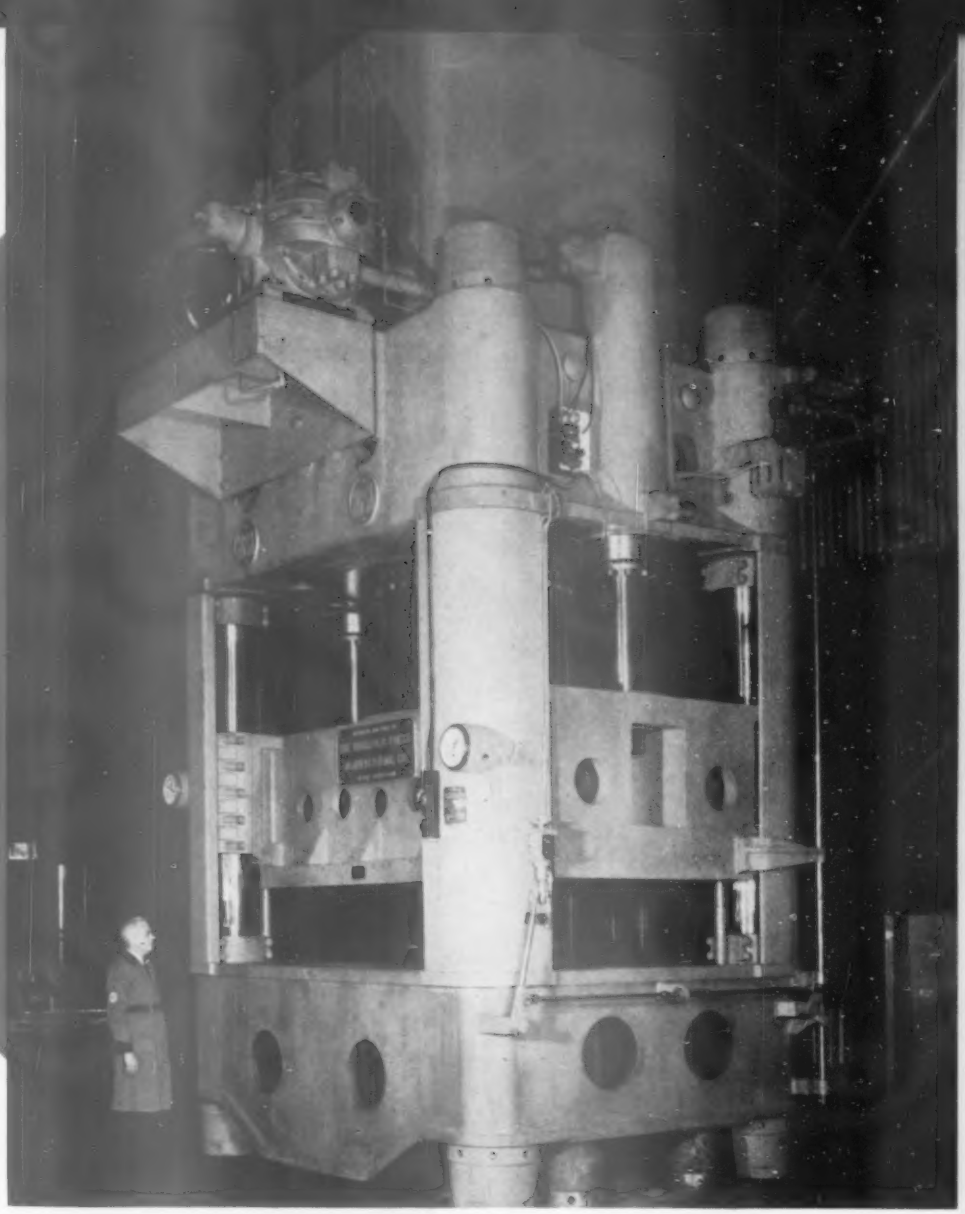


Fig. 1—A 2,500 ton H-P-M "Fastraverse" hydraulic press. The bed is a welded structure. Other members which can be welded on presses of this type are the platen, cylinder head, oil tank and bracket for mounting the pump and electric motor.

Welded Hydraulic Presses

War brought a terrific demand for hydraulic presses of many kinds and types. Welding, called in as an auxiliary fabrication method, made it possible for H-P-M to meet critical delivery dates for vitally needed equipment.

By CLYDE B. CLASON

THE Hydraulic Press Mfg. Co., Mount Gilead, O., is a living example of Emerson's widely quoted mousetrap maker who preferred to dwell in the wilderness. True, the pleasant little midwestern town of Mount Gilead can scarcely be called a wilderness; nevertheless, the company's two large plants *are* sufficient distance away from the din of the nearest city to make the truth of the ancient adage strikingly evident. For H-P-M does make a better "mousetrap"—in this instance, hydraulic press—and virtually the entire industrial United States has beaten a path to its door.

Cider to Metals

As industries go in the United States, H-P-M is an old company. Established in 1877, it built its first hydraulic presses for squeezing apples to make cider—then so widely popular that it could almost be called our national drink. Other types of early presses pertained almost entirely to various phases of food processing. Gradually, however, the company began to make presses which could be used by metal-working and other heavy industries.

Evolution of the hydraulic press to its present impressive form was somewhat leisurely. As late as the middle twenties, hydraulic presses were manually controlled, slow, cumbersome and dependent upon a source of hydraulic power for their operation. The hydraulic fluid was water, which is corrosive to most metals. Water also tended to wash away the lubricant and to pick up dirt, scale and abrasives. The self-contained, oil-operated hydraulic press eliminated all of these troubles.

In 1927 H-P-M introduced a new method of press operation and control which immediately marked the

Fig. 2 (top)—Welding the cylinder to the head of another "Fastraverse" metal-working press. The cylinder head is an all-welded structure.

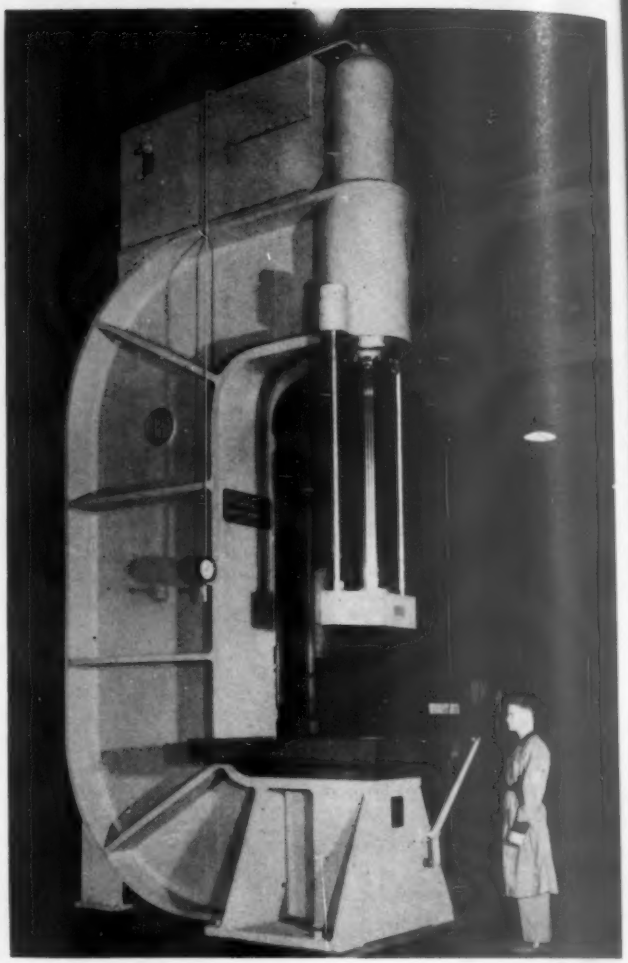


Fig. 3 (right)— Hydraulic forcing press of the open-gap or C-type. The 35,000 lb frame was fabricated by welding plates 2 and 3 in. thick.

hydraulic press as a high-speed, mass-production machine for the metal-working industry. This method, the "Fastraverse" system, is a high-speed, "closed circuit" system of operation, utilizing a radial-type oil pump. Press ram reversal is secured merely by reversing the pump output, without the interference of operating valves. In 1934 the company designed and began manufacturing its own heavy-duty, radial-type pressure generating pumps. Other important developments of the last few years are: double-action presses for the metal-working industry, triple-action presses for the deep drawing of sheet metal, a complete line of plastic injection molding presses, the development of a series of presses expressly for the aircraft industry.

New Plant Doubles Capacity

A second plant, doubling the company's manufacturing capacity, was opened in September, 1940—approximately 14 months before our entry into World War II. This plant had been planned over a period of several years and represented the natural growth needs of the company. It is significant that the walls of the new building were bolted to the frame in order to facilitate future expansion.

War brought a terrific demand for hydraulic presses of many kinds and types. Some war uses: cartridge case cupping, drawing, tapering and heading of either brass or steel cases; piercing and drawing hot steel slugs; forging high-explosive shells; nosing and testing shells; straightening gun-barrel forgings; forging parts for aircraft, tanks and other equipment; quenching and straightening armor plate; drawing and forming sheet-metal aircraft parts.

The company makes hydraulic presses ranging in size from small presses with a pressure capacity of about ten tons to giants which can provide a pressure of 5,000 tons. Prices range from about $250 to $250,000, and shipping weights vary from approximately 250 to 1,000,000 lb.

The component parts for the frames of these presses used to be, almost exclusively, steel castings; now they are being fabricated from steel plate by means of welding and flame-cutting. Castings are still being used and always will be; nevertheless, welding has earned a worthwhile place for itself in hydraulic press manufacture, and there is no reason why its use should diminish in the coming postwar era. Some of the principal types of presses made by the company and the applications of welding on each will be discussed briefly in the paragraphs that follow.

"Fastraverse" Platen Presses

The most universally applied type of all H-P-M presses is the "Fastraverse" platen press (Fig. 1). This type of press is readily adaptable to a wide variety of work such as compressing, forming, embossing, drawing, forging and straightening. Each press is completely self-contained, having its own hydraulic pressure generator and operating system; installation necessitates only the connections of electric current and water for cooling the oil used as the pressure medium.

Beginning at the bottom and working upward, the basic elements of this type of press are the bed, the platen, the ram, the cylinder head, the power-unit bracket (for mounting the pump and motor) and the oil tank. Of these, everything except the ram and the pumping unit can be fabricated by welding.

A typical job for welding is shown by the bed of the 2,500 ton hydraulic press pictured in Fig. 1. This bed is 136 in. long, 100 in. wide, 48 in. deep at the center and 36 in. deep at the ends. It was fabricated by cutting, forming and welding carbon-steel plates; one-piece plates, 3 in. thick, were used for the top and bottom flanges, and five plates, 2 in. thick, were used as webs.

Another welding job, welding the cylinder to the head of a "Fastraverse" metal-working press, is pictured in Fig. 2. The cylinder consists, basically, of a seamless steel tube. The cylinder head is a completely welded structure. On this particular press, the platen, power-unit bracket

and oil reservoir are also of welded construction.

A variation of the basic design is the 200 ton C-type H-P-M forcing press illustrated in Fig. 3. These presses are built in various sizes, according to requirements, and used for such operations as assembling, punching, forming and straightening. The frame of the press shown in the picture was completely fabricated in the welding department of The Hydraulic Press Mfg. Co. from steel plates 2 to 3 in. thick. The inside flange is 3 in., while the outside flange, web plate and all stiffening gussets are 2 in. thick. Most of the welds on this structure are a combination of bevel and fillet types, and in each the prevailing size is equivalent to the plate thickness; namely 2 in. Fifteen hundred pounds of welding electrodes were used to make this frame, which has a total weight of 35,000 lb.

Stretch-Forming Presses

A type of sheet-metal forming which has become quite popular in recent years is stretch-forming over inexpensive wood or metal dies. The aircraft industry has been the principal user. The metal blank is gripped in opposing jaws, which move apart as the platen carrying the die moves upward. The metal sheet is thus formed or stretched to the shape of the die. Extruded shapes can also be formed by employing special fixtures.

Fig. 4 shows the all-welded base of a 150 ton H-P-M stretch-forming press. The total weight of this base is 24,500 lb. The top section is made from a steel plate 212 by 47½ in. by 4 in. thick. A thick top plate is required in order to guide the clamp jaws. The completed machine is shown in Fig. 5.

Die-Casting Machines

Die-casting is another metal-fabricating process that has come into widespread popularity because of the war. H-P-M "All-Hydraulic" high-pressure die-casting machines are used for the rapid production of parts from aluminum, magnesium, copper and zinc alloys. The machine is, fundamentally, a horizontal, self-contained press with a straight-line hydraulic mold clamp. The metal-handling end consists of a "cold" chamber and a hydraulically actuated plunger. The amount for each "shot" is manually ladled from a crucible into the pressure chamber.

Fig. 6 shows the base of a die-casting machine being fabricated by automatic welding. The straight long seams needed on this member furnish an ideal application of automatic welding; shorter welds are, of course, made by manual arc welding. Part of the base serves as an oil reservoir. The prevailing plate thickness is ¾ in., and the structure is well ribbed to support the heavy weight imposed upon it. The completed machine is pictured in Fig. 7.

Extruding Presses for Electrodes

We cannot leave the metal-working industry without mention of a type of press vital to welding—the extruding press which applies the flux coating to electrodes. Extruding presses may be either vertical or horizontal. The vertical type has a downward-acting plunger and two swinging material chambers, permitting the recharging of one chamber while the material in the other is being extruded; the horizontal-acting type employs a single material chamber.

The ingredients for coating the rods are mixed together and compressed into slugs with an H-P-M slug press. The slugs, which are hard enough to be handled yet sufficiently plastic to be extruded, are then transferred into the material chamber of the extruding press. In the horizontal type of electrode-coating press, the rods are fed into the extrusion head at right angles to the axis of the extrusion ram and are pushed through the guiding tube by an automatic feeding device. Simultaneously, the extrusion ram advances, forcing the flux around the rods as they pass through the extrusion nozzle or die. A uniform flux coating is thus extruded firmly about each rod. The coated rods fall on a variable-speed conveyor belt, which carries them

Fig. 4 (above)—This base of a stretch-forming press for sheet metal is an all-welded structure. Note the thickness of the top section; it is made from 4 in. steel plate. The completed press is shown in Fig. 5.

Fig. 5—Stretch-forming press. This machine is used to form sheet metal over inexpensive wood or metal dies. It has an upward-acting die platen and horizontal-acting clamp jaws.

Fig. 6—Automatic welding (submerged-melt) is being used to help make the base of a high-pressure die-casting machine. The short welds were made manually. The completed machine is shown in Fig. 7.

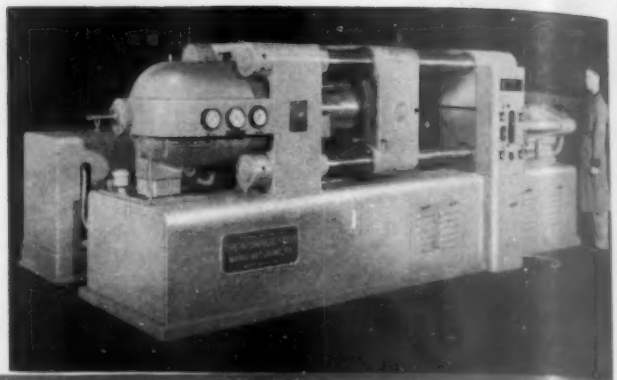


Fig. 7—Metal die-casting machine—a horizontally acting press with a hydraulically actuated plunger and mold clamp. Injection pressure on the material being cast ranges from 5,000 to 30,000 psi.

into a stripping unit to clean the ends for electrical contact and then feeds them into the baking ovens.

Molding Presses for Plastics

Molding presses are vital to the fast-growing plastics industry and are also used for making composition materials for floor coverings and for manufacturing plywood and veneer woods.

Injection molding machines are used to die mold thermoplastic resins such as cellulose acetate, ethyl cellulose, acrylic resin, etc., into finished articles. These presses are horizontal-acting, single-nozzle machines combining two major hydraulic members: a straight-line hydraulic clamp for opening, closing and sealing the mold halves and an injection plunger for injecting the material into the mold. Granular plastic material is automatically fed into the heating chamber.

Compression molding presses are used to mold thermosetting plastics—phenolic and urea compounds. These are upward-acting, semiautomatic platen presses equipped with upper and lower mechanical "knockouts." The press closes rapidly and slows down automatically to the rate at which the material softens.

Fig. 8 shows the base of a 16 oz capacity H-P-M injection molding machine. This base was welded by both manual and automatic welding. Its overall dimensions are 178 by 45 in. by 44 in. high. The bottom of the base serves as an oil reservoir, and the top is designed to accommodate the hydraulic power unit. The finished machine is illustrated in Fig. 9.

The base of a compression molding press is shown in Fig. 10. This unit was placed on a positioner for down-hand welding. The press head and platen of the same machine are also of welded construction.

Other types of presses made by H-P-M include rubber-pad forming presses for light-gauge sheet metal (widely used for flanging and forming aircraft parts), forging presses, shaft-straightening presses, blocking and briquetting presses, presses for powder metallurgy, rayon steeping presses and many others for pressure processing applications.

Uses of Welding

To summarize, the chief uses of welding at H-P-M are:

All bases for injection plastics molding machines and metal die-casting machines are welded. All major press members of compression plastic molding machines are welded except cylinders and rams.

A portion of the platens and beds of "Fastraverse" platen presses for sheet-metal drawing, coining, embossing, etc., are welded. Power-unit brackets for supporting the radial pump and electric motor drive are also welded.

Many frames of presses of special design, built according to the customer's requirements, are welded.

All large-diameter high-pressure hydraulic pipe lines are made secure at their terminals by welding heavy four-bolt flanges to the pipe. This design prevents loose connections and leaks in the hydraulic system.

On all types of machines, the pads for mounting linkage, motors, pumps and other press control mechanisms are welded. Also welded are the steel pad holders used to retain the rubber pads in presses employing the Guerin process for forming, flanging and blanking aluminum-alloy aircraft parts.

Oil tanks (reservoirs) which hold the oil used as the hydraulic pressure medium are welded on all types of presses.

Welding Shop

The company's welding department is in charge of John Hobson, welding foreman. Equipment is complete and up-to-date. There are five a-c arc welders, three d-c welders, one automatic submerged-melt welder, one pantograph-type shape-cutting machine, one straight-line and circle flame-cutting machine and two welding positioners—one of 3 ton and one of 8 ton capacity.

The plates are flame-cut, formed and assembled on jigs by tack welding. Finish welding is then done by both automatic and manual processes. Positioners are used whenever possible to speed output and make the work easier. There are many difficult inside welds to be made, and for these a-c welding is used in order to avoid arc blow. Automatic welding is employed for long, straight seams; it gives deeper penetration, more uniform welds and faster production.

In connection with flame-cutting, it should be mentioned that the shop is called upon to cut a great deal of very heavy plate, some of it as thick as 8½ in. Such cutting is by no means easy.

The welded assemblies are all stress relieved, and this must be done outside as the company has no furnace large enough to accommodate them. Outside stress relieving plus the expense of moving bulky and heavy units from and back to the plant naturally adds to the cost of welded fabrication.

Welding Advantages

As compared to steel castings, welded fabrication offers many advantages. Since the company has no foundry of its own, welded fabrication cuts down its dependence on outside sources of supply and permits closer control of production. Time in delivery is saved—highly important at a period when foundries are still swamped with back orders. Pattern costs as well as the supplemental cost of storing patterns are eliminated.

Fig. 8—Both manual and automatic welding were used to fabricate this base of the 16 oz capacity plastics injection molding machine shown in Fig. 9. Bottom of base serves as an oil reservoir.

Fig. 9—A 16 oz capacity "All-Hydraulic" machine for the injection molding of thermoplastics. A plunger injects material into the mold, and a hydraulic clamp opens, closes and seals the mold halves.

Welded construction gives strength at lesser weight. It conserves steel since less metal is required per machine, and it permits the moving parts of the press to be of lighter weight. This, naturally, cuts down on operating costs.

Cost Comparisons

Beds of a 1,000 ton forging press having a pressing surface of 48 by 48 in. were made both by casting and by welding. Machined costs on each bed were:

Cast steel—$1,801 plus a pattern charge of $325.

Welded design—$1,599.

Saving—$527.

Another example is provided by the bed of a 500 ton platen press with a pressing surface of 72 by 36 in. Machined costs of cast and welded beds were:

Cast steel—$2,003 plus pattern cost of $235.

Welded design—$2,054.

Saving—$184.

Other examples might be given, but enough figures have already been quoted to show that welded fabrication compares very favorably from a cost standpoint with steel castings. It should be borne in mind that the above costs for welded design include and reflect the comparatively high cost of outside stress relieving.

The effect of the war was to greatly increase the use of welding, both to avoid bottlenecks in the foundry and to meet the increased demand for hydraulic presses to make shell cases and various parts for ships, tanks, guns and aircraft. Welding, called in as an auxiliary method of construction, made it possible for the company to meet critical delivery dates for vitally needed equipment.

Future Outlook

Company executives survey the postwar era without trepidation. The two principal fields for use of hydraulic presses are the metal-working industries and the process industries. Before the war, these were about equally important, but the war put the process industries practically out of the picture as press customers. When the manufacture of civilian goods is resumed, these industries are expected to more than make up for any slump occurring in the metal-working industries. A list of specific presses in the process industries and their applications illustrates the after-the-war potentialities:

Dehydrating presses will be used by the rapidly growing dehydrated foods industry to extract liquids from fruits, vegetables, fats, herbs, drugs, chemicals, etc. Similar presses will be needed for steeping and dehydrating cellulose pulp in the manufacture of rayon and cellophane.

Blocking and briquetting presses will be needed for compressing dry salt into hard blocks for feeding livestock as well as for compressing abrasives, carbon powder, ceramic or refractory clays and similar materials into briquettes. Hydraulic presses will also be an important equipment item in the broadening field of powder metallurgy.

The uses and applications of plastics are expected to expand greatly when peacetime goods are manufactured. This will mean a demand for more molding presses of both the injection and the compression types.

The demand by long frustrated consumers for a multitude of small metal articles should greatly increase the need for die-casting presses. The stretch-forming machine is also expected to find wide acceptance in postwar production, especially in the manufacture of parts for aircraft, automobiles, buses, etc. A typical example of postwar production would be the forming of turret tops for autos.

These are only the highlights of the developments that may be anticipated when our nation's swords are beaten into ploughshares and spears into pruning hooks. H-P-M does not expect to use less welding in the post-war era; indeed, it expects to increase present welding facilities materially.

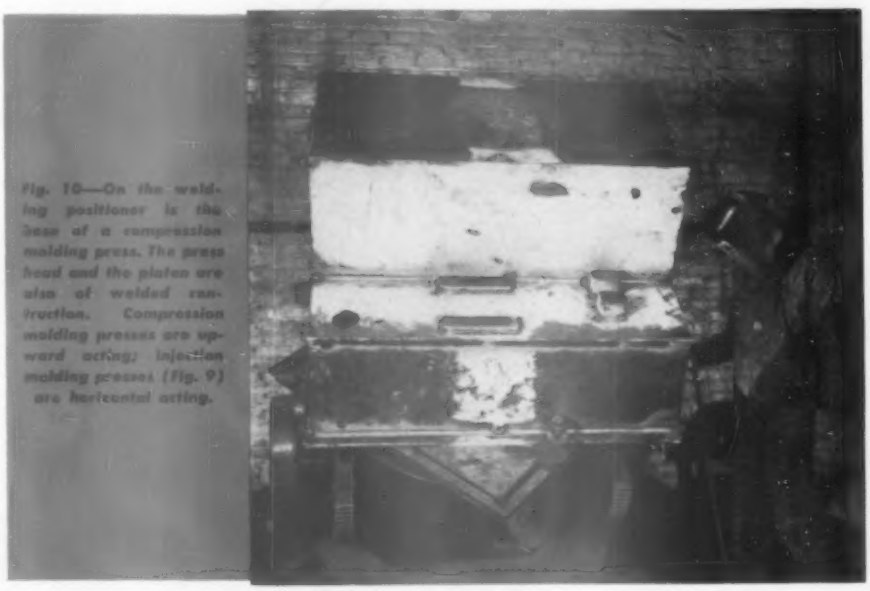


Fig. 10—On the welding positioner is the base of a compression molding press. The press head and the platen are also of welded construction. Compression molding presses are upward acting; injection molding presses (Fig. 9) are horizontal acting.

An Analysis of Hard-Facing

After studying the experiences of successful users, the author predicts that the use of hard-facing today is as a mere child compared to the brawny man it will be when the process is better known and more widely accepted.

By **FRED M. BURT**

More than 20 years ago in Bakersfield, Calif., hard-surfacing (now officially called "hard-facing" by the welding industry) was applied to tail bits used in oil-well drilling. It immediately proved its worth by greatly increasing the service life of salvaged, worn bits, and the cost of drilling was materially reduced. From this little start, the extensive use of hard-facing has become a standard procedure in the petroleum industry. Drillers now use this technique to increase the life of most of the unlubricated surfaces subject to wear, re-applying hard metal to build up a new surface time and again, whenever the very tough alloy finally does wear down.

Used in Many Industries

As time went on, the important advantages of hard-facing were discovered and put to use in many other industries where parts of machinery are subjected to severe conditions of wear. These industries include: mining, agriculture, automotive, excavating, earth and rock moving; the manufacture of brick, cement, coke and gas, iron and steel, lumber and paper; the production of power, glass and aluminum as well as a great variety of other machinery parts.

However, even in these industries where the use of hard-facing has thoroughly proved its value, an overall, complete analysis to determine every practical and valuable application of this "agent of rejuvenation" would undoubtedly show that it is by no means used as extensively as it could and should be.

Going still further, and visualizing all of the possible and desirable applications of hard-facing in all industries in order to provide an extraordinary "tough hardness" for wear-resistance wherever such may be feasible, it is likely to be found that the use of hard-facing today is as a lusty child compared to the brawny man it will be when this technique is better known and therefore more widely accepted as a standard practice.

In the rest of this article I shall cite facts from the experiences of successful users and from the research and records of the technicians who have done so much to perfect hard-facing techniques and materials.

Early Hard-Facings

In the early days, all of the alloy foundries producing hard-facing metals were compelled to supply a considerable number of kinds of such metals without knowing very much about the many varying types of abrasive wear and allied conditions that shorten the service life of equipment

Fig. 1—Before applying hard-facing to the tool joint, oil-drill pipe is first preheated, using the oxy-acetylene torch. Preheating removes the chill from the tool joint and eliminates danger of distortion.

Fig. 2—Using the electric arc method, this welder applies hard-facing to the shoulders of the box end of the tool joint. Note the convenient jig for turning the drill pipe.

All photos courtesy Mir-O-Col Alloy Co., Los Angeles

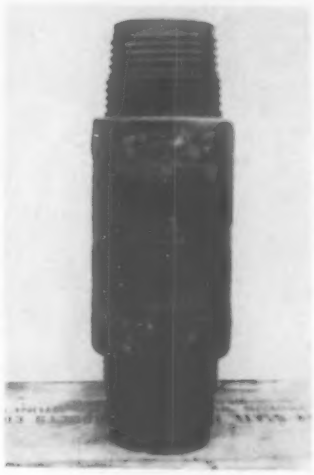


Fig. 3—A double-pin stub of oil-well drilling equipment undercut for hard-facing (left) and after the application of a ⅜ in. thick layer on the two shoulders (right).

parts. A hardness of approximately 55-60 Rockwell C* was considered the yardstick of a good hard-facing material. This degree of hardness is adequate to resist ordinary frictional abrasion, but when applied to surfaces subjected to severe shock or impact the early alloys would often fracture or disintegrate.

In order to increase the toughness and ductility of the hard-facing metal, manufacturers were compelled to sacrifice some of its hardness. To accomplish this purpose, the Rockwell C hardness was dropped to about 35-44, but of course the abrasion resistance was proportionally lowered. It also became apparent that all frictional surfaces will engender enough heat to reduce the surface hardness of their iron or steel components. Thus steel and iron hardened by heat treating will lose their hardness when subjected to high heat.

Needed: Red Hardness

It was evident that a hard-facing alloy usable for a great variety of non-special applications would have to be tough enough to withstand constant, severe impact and also highly resistant to abrasion at all points from atmospheric temperature to high heat (red hardness) as well as corrosion.

One of the best examples of such a general-purpose hard-facing alloy rod has a deposited Rockwell C hardness of 54 to 57, and when the added metal is properly applied it can be built up to whatever thickness is required to give the maximum service life. The hardening properties which give it extreme rigidity and high resistance to galling and abrasion are obtained from metal carbides. To provide the same resistance at high heat, it was found essential to include two alloys of the chromium group in conjunction with either nickel or cobalt. The carbon content (in carbide form) is above 3.75%.

This type of alloy will melt at a lower temperature than steel and will remain fluid longer. The advantage of such fluidity is that all of the impurities are allowed to float to the surface, assuring a deposit free from defects and a perfect bond with the parent metal. This particular alloy is the product of many years of research and development by a pioneer in this field, W. Wesley Mills of Los Angeles.

Oil Field Study

A graphic example of the advantages derived from using all-purpose hard-facing is shown in a case study conducted by Bell and Loffland, one of California's major oil-well drilling companies. Used to hard-face twelve tool joints (Figs. 1 and 2), the deposited metal was applied by arc welding as a 1 in. bead about 3/16 in. thick on the shoulders of the tool joint pins and boxes. Preheating was necessary before application (see Fig. 1). The pin and box joints were numbered from 1 to 9. The three double-pin stubs, numbered 10, 11 and 12, were used to drill a straight hole for 2,500 ft and then were run in a seven-degree directional hole, as were the nine other joints, for an additional 2,475 ft in a typical formation of sand and hard shale. They were then calipered, with the specific results shown in Table I.

No sleeve wear was shown on joints Nos. 2, 3, 5, 7, 8 and 9, which are therefore not included in the table. Double No. 11 was a full gauge 6¼ in. joint, run just above the 5½ in. drill collar and subjected to much more wear than the others. Directional drilling causes at least 25% more abrasive wear than straight drilling in a vertical hole. It is estimated from this study that a double-pin stub (Fig. 3) properly protected with hard-facing will run 10,000 ft per single application of hard-facing in a medium-hard formation of sand and shale such as is found in Southern California. When the original hard-facing deposit eventually wears away, further applications will give the tool joints new leases of service life.

Other Applications

Worn Diesel-engine valves can be reclaimed with hard-facing and will then outwear new valves many times. Fig. 4 shows such a hard-faced valve; it is ground to the correct gauge after the application of hard-facing to build up the worn edges.

Another example is provided by the wrist pin of a Diesel engine (Fig. 5). Wrist pins are case hardened. Prior to the application of the hard-facing, the pin should be preheated to a dull cherry-red and maintained at that temperature during the entire operation.

The thickness of the hard-facing deposit will determine, at least approximately, the length of additional life obtained. An adequate deposit will give from three to twelve times the service life of the base metal, depending on the steel with which it is compared. A conservative estimate is that hard-facing will outwear high-carbon steel about 3 to 1 and mild steel about 10 to 1.

A different, especially hard alloy is used when there are extremely severe conditions of abrasion and frictional heat but impact is comparatively moderate. Examples are plowshares, cultivator sweeps (Fig. 6) and furrow blades (Fig. 7), subsoil teeth, road plows, tar scrapers and subgrader blades. To resist this type of abrasion and frictional heat, the hard-

Table I. Wear on Tool Joints, API Full-Hole 4½ in., 16 lb. Pipe

Joint No.	No. of Feet Drilled	Sleeve Wear on Box End of Tool Joint, In.	Sleeve Wear on Pins of Tool Joint, In.
1	2,500	None	3/32
4	2,500	None	3/32
6	2,500	3/32	None
10	4,975	3/32	3/32 one shoulder; 1/16 other shoulder
11	4,975	None	1/16
12	4,975	None	1/16

*See Engineering Data Sheet No. 38, The Welding Engineer, Dec., 1943, for Hardness Conversion Tables.

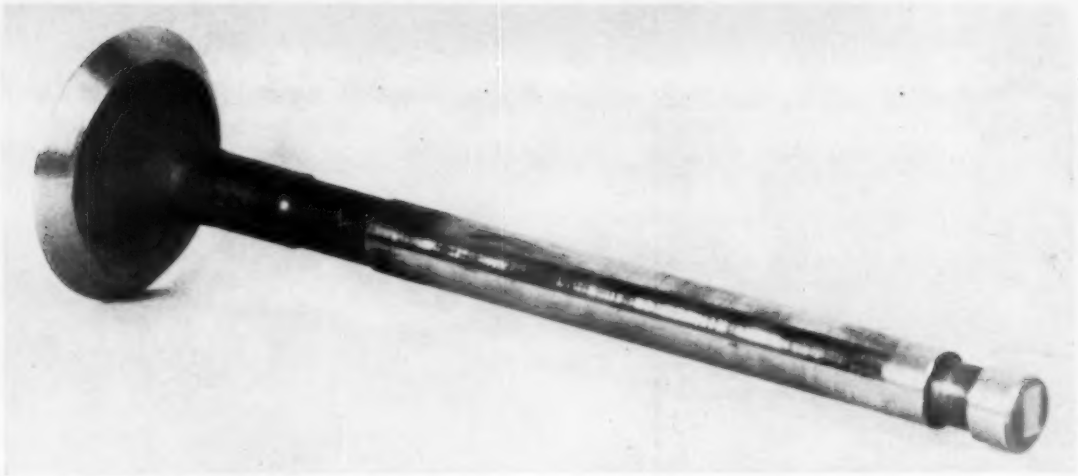


Fig. 4—Hard-faced Diesel-engine valve. Worn valve edges can be built up over and over again with hard-facing.

facing deposit must be thin but unusually hard—61-64 Rockwell C hardness. It should also have a high red hardness.

Farm implements such as those shown in Figs. 6 and 7 remain automatically sharp when hard-facing is used to protect the cutting edges. As the softer metal of the implement blade wears away faster than the hard-facing, the result is a self-sharpening edge.

Oxy-Acetylene and Arc Processes

A few of the primary facts on hard-facing should not be amiss in this article. As readers of this publication know, it may be applied by either arc or oxy-acetylene welding. The oxy-acetylene process consists of sweating the hard alloy upon a softer base metal by using the oxy-acetylene flame to bring the surface of the softer metal to the melting point and then melting the hard-facing into it. Preheating is of vital importance since it is a prime factor in reducing the possibility of failure and insuring a completely satisfactory deposition. Furnace preheating is best, but a gasoline torch can be used where furnace heating is impracticable. Preheating can also be done with the oxy-acetylene torch, but this is unnecessarily expensive.

A different flame from that used for steel welding should be used to apply hard-facing. The tip should be of a type that will give a soft, bulbous (carburizing) flame. It is vitally important that the melting of the parent metal be confined to a shallow depth. Very little penetration is needed to assure a solid bond. A harsh flame would penetrate too deeply, result in an excessive dilution of the hard-facing.

The weldor who wants to learn the craft of hard-facing should become thoroughly acquainted with the oxy-acetylene process before he uses the arc-welding process. For the latter should duplicate, as nearly as possible, the conditions and actions that exist or take place with the oxy-acetylene process. With both processes the rod or electrode is held at a 45 deg angle; the torch, of course, is held oppositely at the same angle. By holding the electrode at a 45 deg angle and using a long arc, the arc action takes on the brush-like characteristics of the oxy-acetylene flame.

Tests for Hard-Facing

The following two severe tests will determine whether or not the right rod has been selected and correctly applied:

(1) Deposit a pad of hard-facing on a small piece of low-carbon steel about ¼ in. thick. Bring the pad to a red heat, and then test it on a grinding wheel. See how fast it grinds off, and then give it the same test cold. Both tests will show the same results if the deposit has the proper abrasion resistance at red heat—the proper "red hardness."

(2) Use the same test piece cold. Place it on a solid surface and pound it with a heavy sledge hammer. Hard-facing of the proper "tough hardness" will not flake off nor disintegrate. If driven hard enough, it should force itself almost through the steel without any parting of the bond. Checks may appear, of course, but if the material flakes off or mushes, it does not qualify as a good, impact-resisting hard-facing.

Manganese steel should be hard-faced only by the arc process, but mild steel, low-alloy steels, high-carbon steels, stainless steel, cast iron and alloy cast iron may be hard-faced by either method. High-carbon steel should be preheated before application and heat treated afterwards. Depending on the alloy, heat treatment is required for some low-alloy steels.

Coverage, Frictional Contact

When properly deposited, the coverage of one pound of good hard-facing is about 22 sq in., ⅛ in. thick, with the oxy-acetylene process and about 20 sq in. with the arc process.

An interesting anomaly occurs when a hard-faced part comes into constant frictional contact with another metal such as mild steel. The steel, being much softer, will of course wear away faster than the hard-

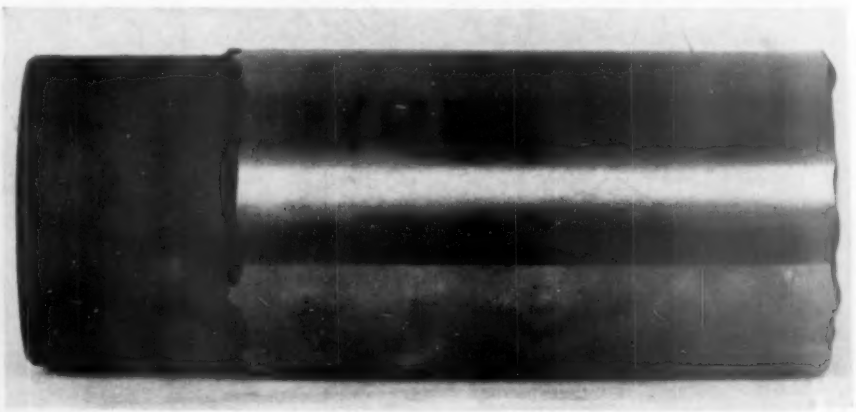


Fig. 5—This Diesel-engine wrist pin has been hard-faced and ground to the correct size.

Fig. 6 — Farm implements undergo severe abrasion and frictional heat but only moderate impact. A ⅛ in. layer of hard-facing was deposited on the edges of this field cultivator sweep, using the oxy-acetylene method after the edge of the blade had been preheated to a cherry-red to avoid distortion.

facing. Strangely enough, however, the steel will not abrade as fast as when it is in frictional contact with another mild steel.

The reason is that most hard-facings have very low coefficients of friction as well as physical properties and structures greatly different from the steel with which they are in contact. When two metals of similar physical properties meet in unlubricated frictional contact, minute portions of their two surfaces will meet in perfect planes. These adhere to each other, and are consequently torn from their respective surfaces by the opposing motions. This condition, known technically as "galling," greatly accelerates wear. Hard-facing, being of different structure than steel, does not have such an affinity but instead tends to repel rather than to combine with an opposing steel surface—a tendency reducing abrasion to a minimum.

Economy Factors

Hard-facing economy is determined by the following factors:

(1) Choice of the proper size of rod. The cost per pound decreases as rod diameter increases. The thicknesses of the base metal and the desired deposit should determine the rod diameter. If a ¼ in. electrode is used on sections less than ½ in. thick, the heat will cause excessive warpage and penetration. The use of $\frac{3}{32}$ or $\frac{3}{16}$ in. electrodes is recommended for sections between ¼ and ½ in. thicknesses, and ⅛ or $\frac{5}{32}$ in. electrodes are recommended for sections under ¼ in. thick. The ⅛ and $\frac{5}{32}$ in. electrodes can also be used on very thick sections, but the work will go more slowly. The smaller rods are best to use whenever very thin deposits or narrow beads are required.

(2) The type, quality and cost of the rod are also primary economy factors. The type should be that recommended by the manufacturer's representative or service engineer, or it may be determined by an engineering study. The quality is determined by the service rendered on comparable or parallel applications. To facilitate comparisons, the cost should be reckoned on a basis of hours of service life per dollar of applied rod cost. The percentage of deposition also enters into this factor since it is quite important that as high a percentage as possible of every pound of rod used shall become a serviceable portion of the hard-facing applied to the part.

(3) The choice of the proper method—arc or oxy-acetylene—and the cost of application are further factors. The facilities of the users, the metals to be hard-faced, and the advice of hard-facing manufacturers all help to determine the best method to use. In addition, the ingenuities of the weldor and his associates, proper jigging and good old "horse sense" have much to do with lowering the cost of the job. As with many other techniques employed in industry, the man on the job very frequently develops ways and means which are quite illuminating and even astounding to engineering specialists.

Worn Parts Used Again

(4) The final and most important cost factor is determined by a comparison between the service the subject part will give without hard-facing and the increased life given to it by a proper hard-facing deposit. In making this analysis, don't forget that: (*a*) the life of uninterrupted productive use is greatly extended by hard-facing, and (*b*) many parts worn down and discarded can be salvaged for further extended use by hard-facing them, not only once but many times. Thus, instead of many replacements, one unit can be used over and over again—a vital point under present wartime scarcities. The necessities of re-use we have learned in these days of having-to-do-without have taught us that we were very wasteful in days gone by when it was so easy to "buy a new one."

The use of hard-facing is sure to increase in days to come, for its economies will still be evident even after all manner of equipment supplies have become plentiful once again.

Fig. 7—A hard-faced deposit about ⅛ in. thick is being applied to the wearing edges of this furrow blade. Note the torch angle and the long, brushlike (carburizing) flame.

Welding for the Armed Forces*

Weldors in the Canadian army face problems similar to those our own G. I. weldors encounter. Here is a first-hand account by a man who spent seven months with the Canadian forces in England, visiting various workshops.

By **R. G. ALISON**
Welding Engineer, Lincoln Electric Company of Canada, Ltd.

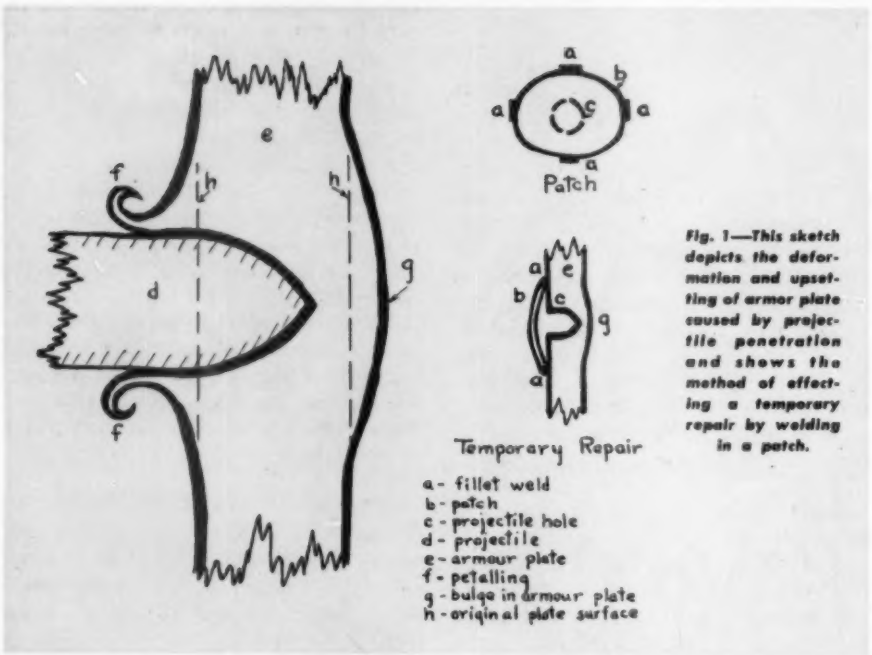


Fig. 1—This sketch depicts the deformation and upsetting of armor plate caused by projectile penetration and shows the method of effecting a temporary repair by welding in a patch.

It would be an impossible task on the fighting front to replace each weapon or piece of equipment with a new unit, not only because of the length of time required to procure such replacements but also because of the huge reserves of equipment that would be necessary. As often as possible, therefore, weapons and equipment are repaired and replaced in service. Welding and cutting have played an extremely important part in this phase of warfare.

Keeping 'Em Fighting

An efficient and alert repair organization is necessary. The proper maintenance organization may quite conceivably be responsible for the amazing persistence of a force when attacking or its equally surprising powers of recuperation when it is being attacked day after day.

Some typical examples may serve to illustrate the applications of the welding and cutting processes:

If a towing eye is pulled off a loaded trailer, an effective repair may be made in about 20 minutes by welding and cutting. Without welding, a replacement part would be required, and this might take days to arrive. In the meantime, one load of equipment would not reach its destination, and the unit would be one vehicle short until a new one was supplied.

Armored fighting vehicles are quite often hit obliquely to the surface of the armor so that the projectile ricochets, gouging but not penetrating the armor plate. Such gouges may reduce the effective thickness of the armor at that point to about one third of the original, and these weak spots can allow an antitank rifle to knock out the tank unless they are repaired. The "scoops," as they are called, are trimmed evenly by oxy-acetylene or arc cutting and filled in with metal deposited by arc welding. The repair takes a few hours, but it may save the tank from destruction or capture.

Direct Hits on Tanks

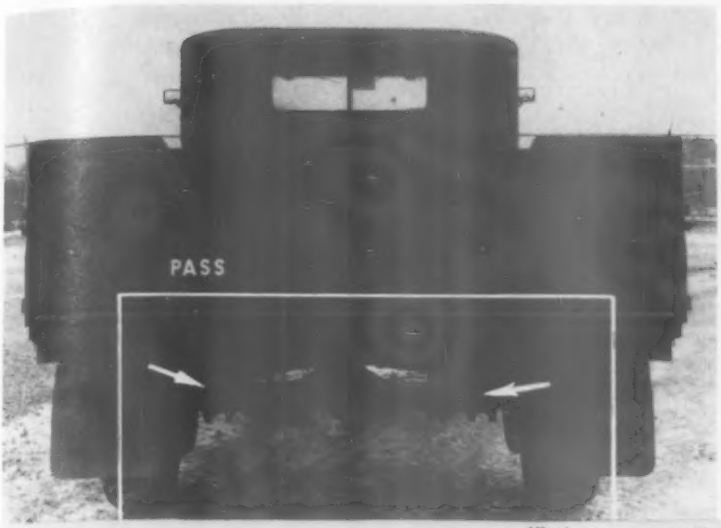
When the hull of a tank has been penetrated by an armor-piercing projectile, the hole must be either filled or patched in order to restore the resistance of the vehicle to enemy attack. The repair job may take a day or so. Without the cutting and welding processes, a replacement hull or tank would be required, and the reserve from which it was drawn is decreased by one tank. Thus valuable offensive or defensive power is temporarily lost, unless the non-effective equipment is put back into service.

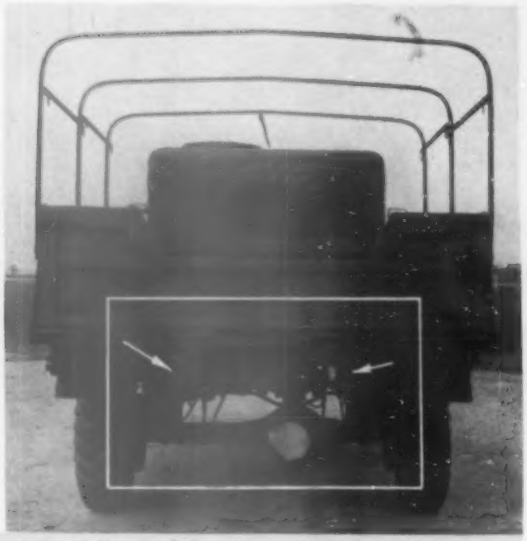
Fig. 1 shows what occurs when an armor-piercing projectile penetrates armor plate. The plate bulges on the inside and upsets on the outside, forming "petals" of steel. These are removed by arc cutting or by oxy-acetylene cutting.

A temporary repair can be made by arc welding to the hull an oval-shaped patch of armor plate which has been dished as shown in the righthand sketch. The type of electrode best suited for this work is the 18% chromium 8% nickel variety. Only four tack welds are required to attach the patch to the vehicle; these are sufficient to withstand either a direct hit on the patch or a hit at an oblique angle on the patch by small arms fire or antitank rifle. The spatter from small arms projectiles will not enter the tank, though some of it may succeed in getting under the patch.

If a permanent repair is ordered later on, the patch is removed, and the deformed weld metal is cut out. The hole is then filled up with weld metal. As an alternative to the patch method, a piece of projectile is sometimes fitted into the hole after the petalling has been removed. This piece is cut to rest about ¾ in. below the surface

*Abstract of a paper presented before the Canadian Welding Society in Toronto. Mr. Alison wrote this paper as a result of a visit to the Canadian forces in England, his duties being to set up procedures for the repair and maintenance of equipment for the armed forces.





All photos courtesy, Ford Motor Co. of Canada, Ltd.

Fig. 2—Old-type of tow bar brackets are indicated by white arrows. It was decided to raise the height of the tow hook by 6 in. (see Fig. 3).

Fig. 3—New tow bar brackets of arc-welded construction were quickly fabricated in the field.

of the tank, creating a depression to be filled with weld metal.

Correcting Defects in Design

Pilot models of weapons and equipment are tested extensively under synthetic conditions simulating those encountered in action. Many weaknesses are generally found, and these are corrected before the equipment reaches the production stage. Thus our military forces are supplied with equipment of the highest possible quality. Even so, weaknesses which were not apparent during the tests occasionally show up in the field and cause failures of varying severity. When this occurs, all of the equipment in use and also the existing reserves of that equipment must be modified so that it will deliver better service.

The modifications may be relatively simple to make by welding. For example, it may be necessary to weld a riveted section when it has been found that the rivets loosen up in service. Or it may be necessary to change the position of the lights on a vehicle or the arrangement of the camouflage or accessory-carrying devices. By means of welding and cutting, such modifications can be made quickly and economically.

The arrows in Fig. 2 point to the brackets which support the tow bar on a military truck. It will be noticed that the tow hook is below the vehicle frame. In order to raise the tow hook height by 6 in., it was found necessary to redesign the tow bar brackets in the field so these would fit in the chassis as shown in Fig. 3. The new brackets were fabricated in a quick and economical manner by arc welding.

When one considers the magnitude of the manufacturing organizations supplying our war effort, it is difficult to understand why any manufacturing would be done in army workshops. However, a small amount of special equipment may be required, or equipment of a secret nature may be developed. Since the number of parts required and the time allowed would not justify the retooling of a production plant, this fabrication is done in army workshops supporting the front.

Underwater Fittings

For instance, equipment and weapons must be provided with adequate protection against water, particularly so when they are to be used in landings made from barges. Gasoline engines on the propelling equipment must be able to operate under water and vital control compartments must be protected. It must also be possible to supply air to internal-combustion engines for cooling and combustion, even though the motor may be 5 to 6 ft under water.

The fittings to provide this protection are completed and attached in place on the vehicles in army workshops. The fittings are of completely welded construction, and arc welding is also used to attach them to the vehicles. No other processes than welding and cutting would provide the necessary versatility in the dissection of and fabrication of metal parts.

Fig. 4 shows the equipment used for this work—a lorry with a separate motor-generator set on the back. This lorry also carries electrodes, welding rods and oxy-acetylene welding equipment. It is provided with a canopy and when in transit looks as shown in Fig. 5. Appearing like any other army vehicle, it will not be subject to attack as readily as if the contents could be easily identified. The canopy also serves to blackout a repair job being done in the field so that the light produced by the arc will not attract enemy patrols or snipers.

Canadian Army Weldors

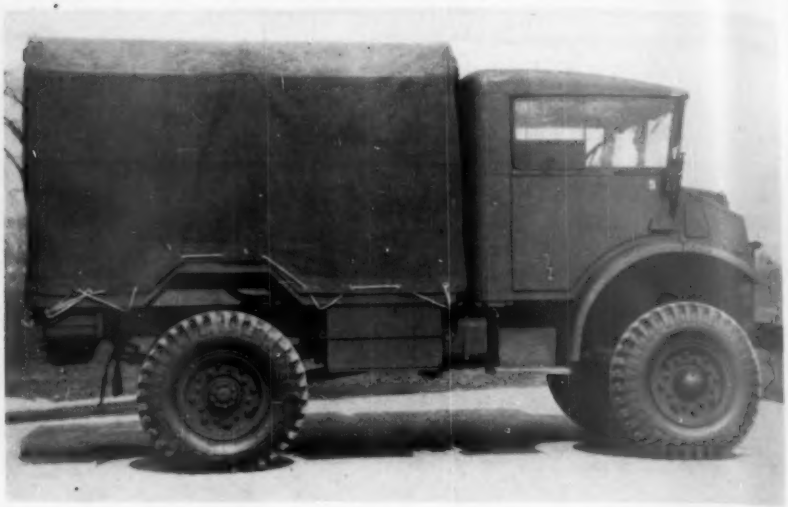
This story would not be complete without a word about the welding operator—the chap on whom the effective use of the welding and cutting processes depends. Few civilians can appreciate the amount of welding ability that is required in the services. Canadian army weldors must be able to weld or cut all metals within reason, using either arc or gas processes according to the circumstances of the supply encountered. If a workshop's supply of oxygen and acetylene becomes depleted, for example, all welding and cutting work must be done with the arc welder. Gasoline, fortunately, is usually available.

Any Equipment, Any Materials

Army weldors must have the ability to use captured enemy equipment and materials, and this necessitates a sound understanding of the operation of all types of equipment and the characteristics of welding materials generally. They must be able to use the material and equipment available, even though they, personally, may not feel that it is perfect. Under no circumstances are particular makes of material considered; if a suitable type

Fig. 4—Lorry (truck) equipped with arc welder motor-generator set for field maintenance work.

Fig. 5—The canopy camouflages the appearance of the portable welding shop shown in Fig. 4 and also provides a blackout of field welding operations.



is available, the job—whatever it may be—must be done.

These men must be able to estimate the time required to do a particular job and be familiar with all of the methods employed to make a more effective job or do work more quickly. Sometimes they are able to do their work in a light, well-ventilated building with a cement floor, a good roof, a stove and lots of time, but they must always be prepared to work at night in the field under an effective blackout (which they must know how to erect in the rain or the mud), sometimes within range of enemy guns. You may rest assured that being under fire does not contribute towards a steady hand, but these chaps master the art of doing good welding under such circumstances. And of course they must have a knowledge of all metals and their reactions under welding or cutting conditions in all positions and by either process.

He Works *and* Fights

The army welding operator must be so trained physically that he can stand up under pressure to the amount of work which comes his way, whether it be one or twenty-four hours per day. If necessary, he must be able to pick up a gun and defend his workshop against enemy attack. It's a plenty tough job, but there are men with this assortment of qualifications.

The fellows who ultimately do this work are selected either on a basis of their civilian experience or their qualifications in mechanical trades. Their training [Canadian army] is designed to further develop these qualifications. At the completion of their training, which takes about six months, they become maintenance weldors of the uppermost bracket.

Certain differences in welding equipment and nomenclature must be learned when the North American operator crosses the seas. For instance, the oxy-acetylene gauges used in North America require adapters before they will fit English gas bottles. And on English equipment, the valve controlling the flow of the cutting oxygen in the cutting torch is open when the lever is released. On this side of the Atlantic, the lever is depressed when the cutting stream of oxygen is released, and this method gives much better control of the torch.

Other Welding Peculiarities

In England, the welding operator refers to electrodes as electrode positive-work negative or work positive-electrode negative, the same as we do. However, if the English weldor refers to straight-polarity electrodes, he means electrode positive where we would mean electrode negative.

Welding electrodes on the other side are designed for ease of operation, smooth operation and finish, with speed being subordinate to these factors. On this side, speed of operation and economy are considered more important than the smooth operation of the electrode.

In discussing quantities of electrodes, we talk in terms of pounds, but in England the designation is by feet—one lb of $\frac{5}{32}$ in. diameter electrodes equals about 12 ft. The sizes in both countries are dependent upon the diameter of the core wire, but on this side the diameter is designated in fractions of an inch, whereas an English weldor talks in terms of standard wire gauge.

Resistance Welding

Courtesy, Resistance Welder Manufacturers' Ass'n

★ PRODUCTION

All-Welded Invasion Barges

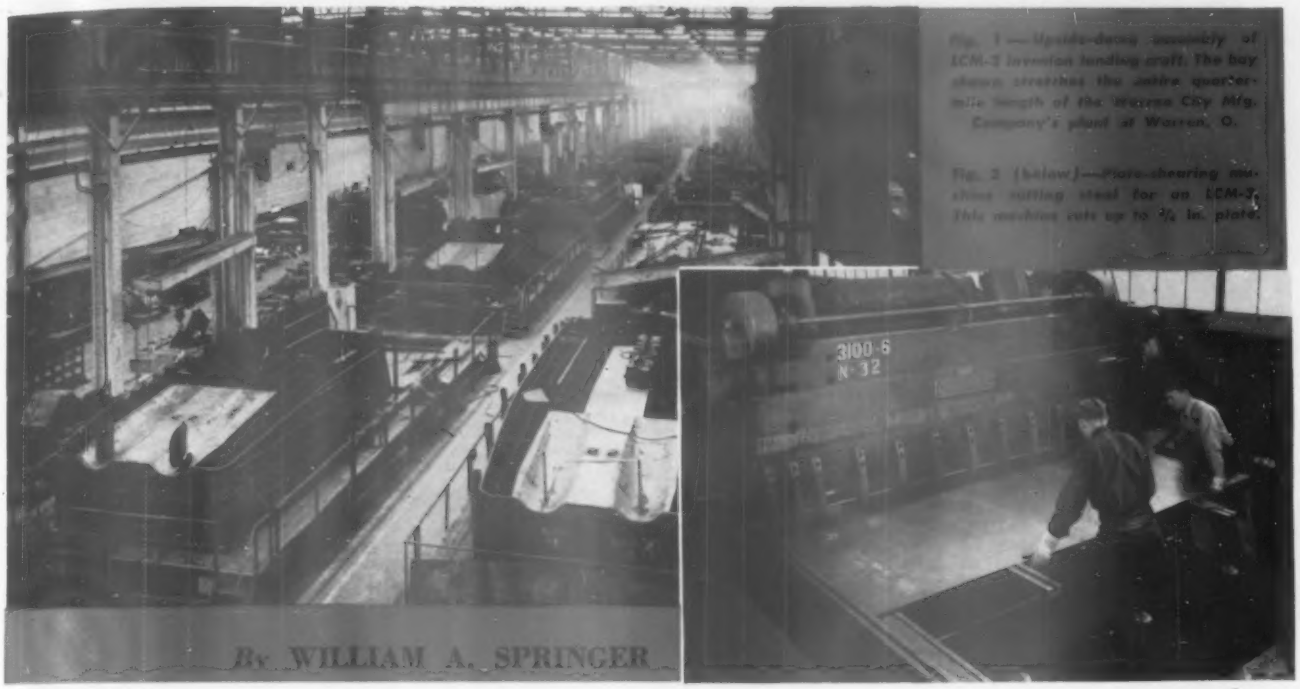


Fig. 1—Upside-down assembly of LCM-3 invasion landing craft. The bay shown stretches the entire quarter-mile length of the Warren City Mfg. Company's plant at Warren, O.

Fig. 2 (below)—Plate-shearing machine cutting steel for an LCM-3. This machine cuts up to 2½ in. plate.

By WILLIAM A. SPRINGER

FIFTEEN tank-landing craft a month are turned out in an inland town where there isn't even a river suitable for launching them! It sounds like one for Ripley, but it is merely an example of what the automobile industry is able to accomplish when it turns its assembly-line techniques loose on products which before the war it would have been deemed impossible to manufacture on a mass-production basis.

An Inland Shipyard

The company concerned is the Warren City Mfg. Co., Warren, O., a subsidiary of Graham-Paige Motors Corp. Warren, population 45,000, is strategically located in the heart of heavy industry—the district is often spoken of as the "Little Ruhr." The city is on the main line of the Erie Railroad, 1 hr from Cleveland, 2 hr from Pittsburgh, and surrounded by sources of all the raw materials necessary for iron and steel manufacture. Everything is in its favor for shipbuilding—except, of course, the fact that it is not near any large body of water. How this one disadvantage was cleverly overcome will appear later.

The LCM-3, Landing Craft Mechanized, which the Warren City plant is manufacturing on an assembly line, is a barge designed for the difficult task of landing men, tanks and other war materiel on a hostile shore in the face of enemy opposition. It measures 50 ft long overall, 14 ft wide, 11 ft deep and weighs about 25 tons. Its draft, loaded, is only about 3 ft, but it is capable of transporting a 30 ton load. This craft carries a No. 1 priority for Navy construction.

Carried by Cranes

The assembly line at the Warren City plant is located in a great bay (Fig. 1), which stretches the entire quarter-mile length of the building. Two 20 ton overhead cranes pick up each hull like a child's toy and carry it down the line for progressive assembly.

In the parts-preparation end of the building, plates are received in carload lots and cut to size for the LCM fabrication. The cutting is done by huge plate shears (Fig. 2), which are capable of slicing through steel plates as thick as ¾ in. Heavier thicknesses or shapes for special parts (Fig. 3) are handled by flame-cutting machines. Most of the hull plates are ⅛ in. or less thick, though some of them are as heavy as $\frac{3}{16}$ and ¼ in.

The barges are constructed upside-down on a series of ingenious steel, concrete and wooden jigs. The cranes which lift and carry them from station to station also serve to reverse them to their proper position for final fabrication, Diesel installation and testing. The assembly line consists of six huge jigs (stations), each providing a separate stage of operations for the preassembly of the various sections. In addition, there is a final station for painting and inpection and a 34,000 gallon tank in which each craft is tested for seaworthiness.

First Station Assembly

At the first station the stern section of the barge is preassembled and then set into the main assembly jig. The 18 steel frames which make up the full framework are preassembled and also set into the main jig. Fig. 4 shows the final stages of rib and framework construction.

The skeletonic craft is now moved to Station 2, where its side plates are welded in position. From here it goes to the third station, where cross beams and bulkhead plates are installed to divide the craft into compartments, so that in case of damage only affected sections of the hull will be flooded.

Cross beams are welded to the side plates at Station 4 to provide a solid frame for the hull bottom plates. The latter are installed at the fifth sta-

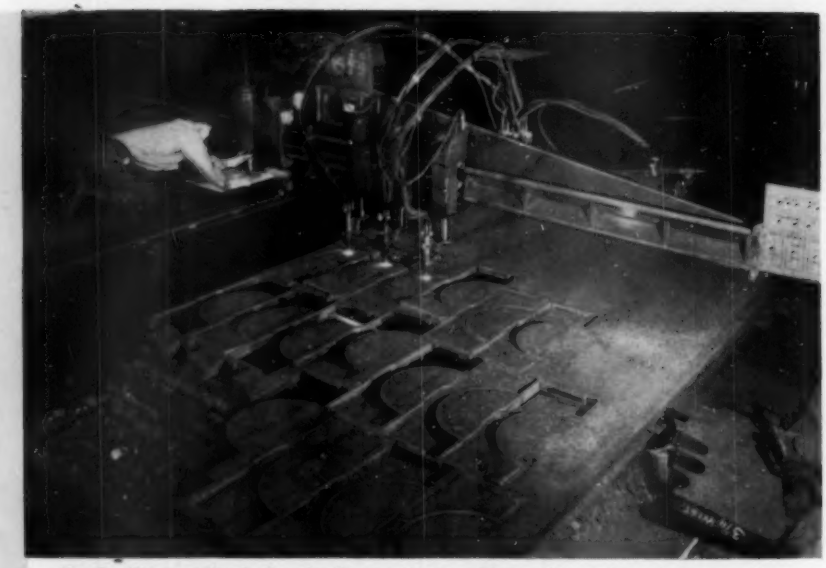


Fig. 3—Shape cutting is done by flame-cutting machines. This pantograph-type machine follows a template or a drawing and cuts multiple shapes from heavy plate.

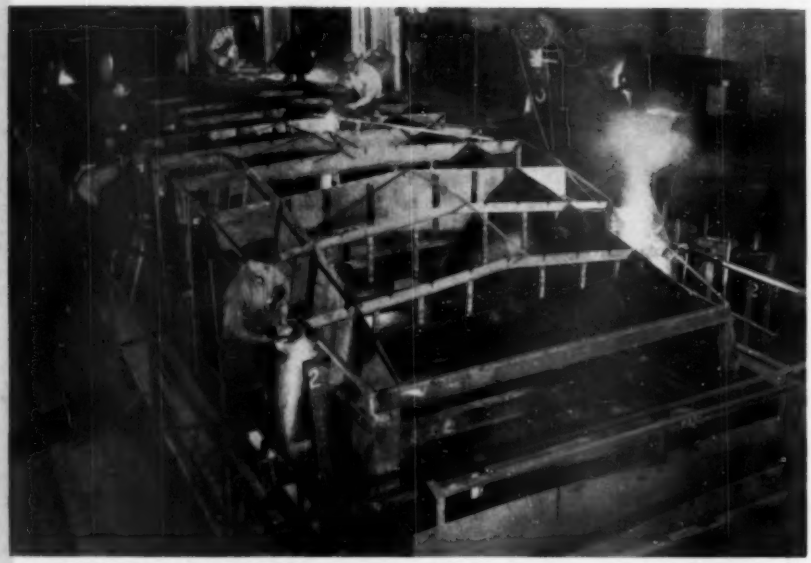


Fig. 4—LCM-3 on fabricating jig at the first assembly station, showing the final stages of rib and framework construction. Note that the craft is being built upside-down.

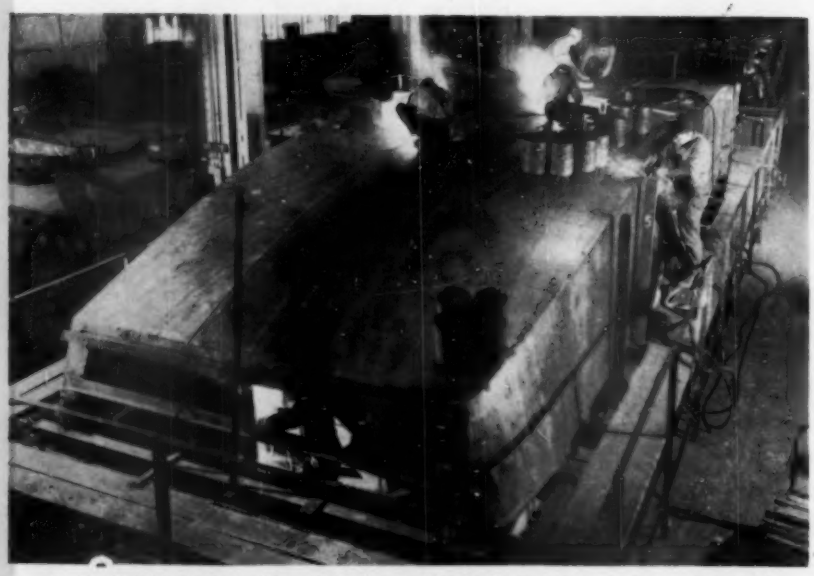


Fig. 5—Welding bottom plates at Station 5. This is the last stage of the work with the craft upside-down. Heavy weights hold the plates in place until they are welded.

tion (Fig. 5). Heavy weights hold the bottom plates securely in place until the welding has been completed.

Hull Now Reversed

This is the last stage of the work with the craft in "bottoms up" position. While being transported to the sixth station, the hull is turned right-side-up for the welding of the deck plates (Fig. 6) and installation of the landing ramp (Fig. 7). While this work is going on, the twin Diesel engines and driving mechanism are installed as well as all accessory control equipment.

The craft is now ready for launching in the 34,000 gallon "indoor ocean" (Fig. 8). This is merely an all-welded basin 63 ft long, 18 ft wide and 6 ft deep. The barge is securely lashed down with steel cables to keep it from leaping through the tank when the engines are turned on. It is tested for two hours under its own power, riding up and down on the waves created by its propellers and powerful Diesels and straining vainly at the cables which arrest its forward progress.

Naval Inspection

Upon successful completion of this test run, the barge is removed to a final station for painting and final inspection. The latter is done by Navy inspectors under the supervision of Captain R. T. Hanson, inspector of naval material and supervisor of shipbuilding for the Cleveland district, and Lt. D. E. Dallman, resident inspector of naval material and assistant supervisor of shipbuilding for the Warren area. Lt. Dallman has his headquarters at the company's executive offices and is assisted by a staff of 35 inspectors and clerks.

Inspected and approved, each LCM is shipped on a gondola freight car to the port of embarkation. It is loaded on its side, with landing ramp and pilot house detached for shipment. Its 14 ft beam becomes its height on the freight car and necessitates careful and often roundabout routing in order to avoid low bridges and tunnels.

Trains Own Weldors

More than a mile of welds are required for the construction of one LCM-3 hull. The work is done by skilled weldors who have passed Navy tests. About 35% of them are women, and a large number of all the weldors employed were trained in the company's own school, which is operated in conjunction with the Ohio State Department of Education. All types of arc welding are used—d-c, a-c and automatic (submerged-melt)

for long seams. As a safety precaution, d-c welders are used exclusively in all inside welding.

The Warren City Mfg. Co. was organized by Joseph W. Frazer and a group of associates in February, 1944, to purchase the assets of the 50-year-old Warren City Tank and Boiler Co. Now a subsidiary of Graham-Paige, of which Mr. Frazer is chairman, the company's production operations are under the direction of Vern R. Drum, formerly vice-president in charge of manufacturing at Willys-Overland Motors.

Plant and Equipment

The company's modern plant was built and equipped by the U. S. Navy in 1942 at a cost of approximately $7,000,000. The factory is ¼ mile long and contains 225,000 sq ft of floor space. It is one of the most completely equipped shops in the nation for fabricating, welding, machining and assembling heavy metal products.

The welding equipment includes 188 a-c arc welders rated at 500 amp, 55 d-c welders rated at 300 amp, eight a-c/d-c welders (two 400 amp and six 300 amp), and two submerged-melt automatic welding machines. Fourteen flame-cutting machines of various types permit straight-line and circle cutting, squaring and beveling of plate ends and shape-cutting operations in which a drawing or template is followed.

Warren City is an extensive user of welding positioners, owning 44 of them. Of these positioners, ten have a ten ton capacity, 16 a seven ton capacity, eight a three ton capacity and 10 a 1¼ ton capacity. There are also 55 cranes, with hoisting capacities ranging from 1 to 20 tons.

Other equipment includes three modern gas-fired heat-treating and stress-relieving furnaces, the largest of which will take pieces up to 12 by 12 by 40 ft, and complete shot-blast and sandblast facilities. For detecting welding, forging or casting faults, the company possesses four X-ray machines, capable of looking through steel plates up to 4 in. thickness, and a complete developing laboratory and viewing equipment.

Other War Materiel

Besides LCM-3s for the Navy, Warren City has made and is making a wide variety of other war products. These include: Diesel engine crankcases for submarines and other craft; generator bases, frames and oil pans; gear drives for cargo ships and destroyers; transformer housings; boiler turbine cases and 155 mm gun rails.

Fig. 6 (above)—Well deck plates are being welded to supporting channels and beams at the sixth and last assembly station. The barge has been turned right-side-up by two overhead cranes.

Fig. 7 (right) — A landing ramp is being installed at the sixth station. Women workers are welding deck plates and the craft is almost ready for its bulkhead tests.

Fig. 8 (below)—Each barge is tested for two hours under its own power in a 34,000 gallon "indoor ocean." A worker may be seen at the control panel on the pilot deck. The woman worker near the landing ramp in the foreground has already started cleaning to prepare for spray painting.

Welded Handling Equipment

★ Part Two—The transportation of parts and assembled units inside the factory requires skillful planning. Mr. Brooking tells how welding is used to fabricate a wide variety of steel units for handling materials.

By **WALTER J. BROOKING**

Director of Testing and Research, R. G. LeTourneau, Inc., Peoria, Ill.

Fig. 10—These welded monorails and suspending hooks, together with the racks for small and medium-sized parts, are the result of the freedom of welded design.

One of the most vital parts of a factory's organization and material equipment is its transportation and handling system. As much careful study and planning must be done for effective transportation, handling and storage as for the actual manufacture of the product.

In this two-part article, Mr. Brooking gives examples of arc-welded containers and machines for transportation and handling at R. G. LeTourneau, Inc., a factory which manufactures heavy earthmoving equipment. Last month he discussed the construction of welded skids, tote bins, storage bins and racks, wheeled wagons and buggies. The present installment is devoted to such devices as welded monorails, chutes, roller conveyors, overhead cranes, jib cranes and portable tractor cranes.

Monorail Construction

A WELDED monorail system and accessories for hanging the units on the monorail are shown in Fig. 10. This picture illustrates the simplicity of the welded design. The monorail itself consists of relatively light, regular mill run I-beams, which were cut to length, bent to shape and welded to trusses at whatever intervals were convenient and necessary.

The ease with which special hanging devices can be made for use with monorails is also illustrated by this picture. Though relatively heavy, these welded structures are small enough so that it is not practicable to hang each individually on the overhead monorail roller. Instead they are hung on a rack, which is pushed along the processing line (the sand-blasting booth in this case)—a simple operation for one man.

An almost endless variety of hooks, small racks and suspending equipment for use on such overhead monorail systems can be made quickly and easily by welding.

In much the same way as monorails are made, an almost endless variety of delivery chutes can be made for transferring parts or packages from one floor level to another or for other transfer purposes. Light-gauge steel sheets are cut for this purpose, bent into the desired width and height of trough and reinforced with panels, angles or other available shapes to withstand the loads to which they will be subjected. The structural framework for anchoring and supporting the chute in its proper place in the transportation system is then provided.

Roller Conveyors

The section of roller conveyor shown in Fig. 11 is another example of the application of arc welding. The relatively small amount of material and labor required to place these roller conveyors in their proper location and to anchor them solidly makes the use of welding very effective and economical. Such conveyors are often the carriers of very heavy loads, and the structural strength and rigidi-

Fig. 11—The need for strong and rigid supports and anchors for roller conveyors is ideally met by welded construction.

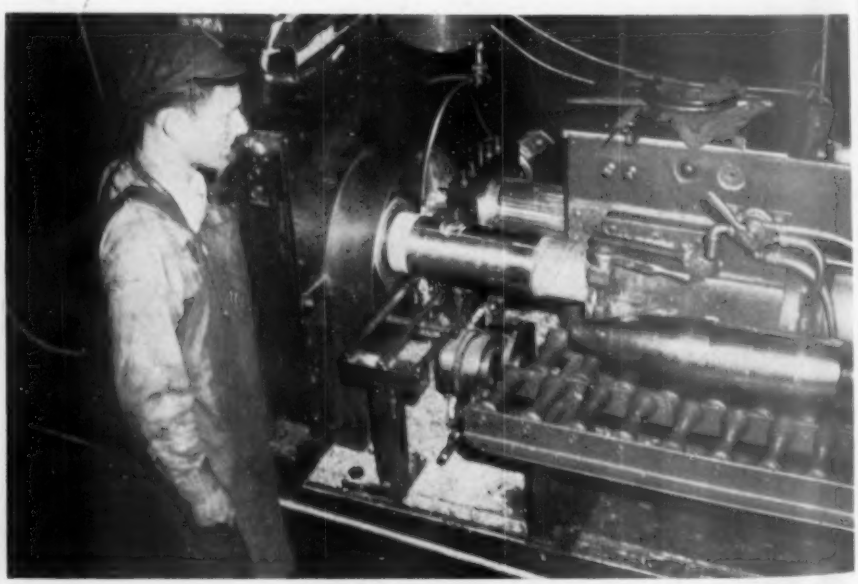


Fig. 12—Half the length of a ten ton, 100 ft span overhead crane. Note the narrow space between the rafters and the top of the jib crane post.

ty of arc-welded construction provides the strength-with-lightness necessary to conserve space and materials. Floor space conservation is very important in most factories, especially when conveyors are used to form assembly stations.

Overhead Crane

One of the places where the resourceful shop man or the clever designing engineer can make the most effective use of arc-welded design and fabrication is in the building of factory overhead cranes. Fig. 12 shows half the length of a ten ton, 100 foot span all-welded steel crane. This crane is of a uniquely simple though somewhat unconventional design. Essentially, it is made up of two rolled-steel I-beams of deep section; the lower inside flange of each beam serves as a base for the cross carriage rails, and the whole is supported on two wheels on each end which run on rails welded to the frame of the building. The cross carriage is a four-wheeled rigid frame supporting the hoist block and electrical hoist. The gear box at the extreme left of the picture contains the driving gears: the main crane drive shaft is driven by an electric motor directly in front of the gear box.

This particular crane requires an operating clearance only a very few inches more than the depth of the main span I-beams. Since the bottoms of the factory roof-supporting trusses extend straight across the building from the top of the walls, the top clearance of the crane was somewhat limited.

Jib cranes (also shown in Fig. 12) are used in the same factory independently of the overhead crane. The greater the height of the crane boom from the floor, the more effective is the jib crane as a handling tool. The extremely shallow overall depth of the overhead crane, made possible only by arc-welded construction, gives maximum efficiency to the jib crane system as well as adequate overhead crane service.

A Welded Jib Crane

The welded jib crane shown in Fig. 13 represents another efficient and space-saving handling device. This is a two ton crane with a boom radius of 25 ft. The bottom of the boom clearance is 18½ ft above the floor. Here again, the welded steel sections reduce the space needed for boom and reinforcements, and they are light enough to give maximum lifting height in the space available. No other

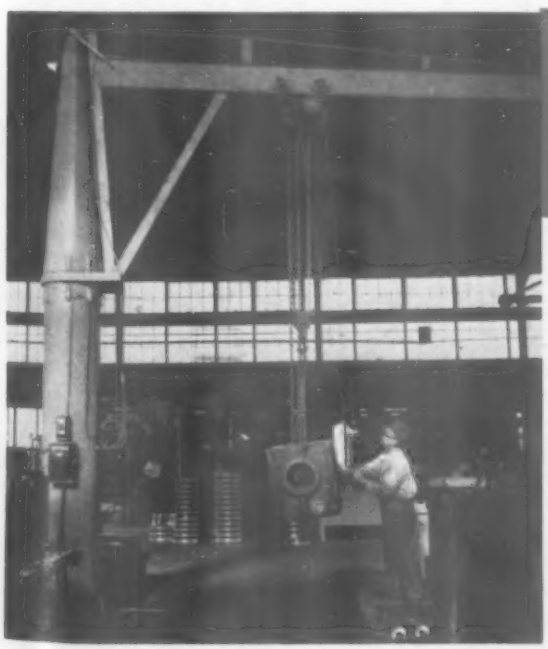


Fig. 13 (left)—A two ton jib crane. Its load capacity and 50 ft sweep give an indication of the rigidity and strength inherent in welded, high-tensile steel construction.

Fig. 14 (below)—A half ton welded hand hoist boom and post. Simple, yet very practicable.

Fig. 15—A highly mobile tractor crane used within the factory and the storage yard. A few simple accessory fixtures were welded to a standard farm tractor in order to produce this unit.

economically available material than welded steel could resist the deflection to which this jib crane post is subjected.

The main structural part of the boom consists of two ordinary I-beams of high-tensile steel welded together. Standard square bars are welded to these beams for hoist roller tracks. The post is made from standard rolled steel plate, flame-cut and welded into a rigid, light, strong structure. Bars, boxbeams and plates are cut, bent and arc welded to the post or boom to complete the crane.

It should be noted that the highest point on the crane is only 25 in. above the bottom of the 25 ft boom. This important space-saving design is a splendid example of the economies of space and material made possible by arc-welded design for factory jib cranes.

Fig. 14 shows a much simpler, yet equally effective hand hoist jib crane. A piece of pipe, a box section made of two angles, a light steel I-beam and a bearing plate are unified by arc welding to make up the boom. A smaller piece of pipe, welded to a bearing plate at the bottom and to a steel rafter at the top, constitutes the crane post. Light, simple, inexpensive, this crane is very effective for handling weights up to half a ton within a 15 ft radius of its post.

Portable Tractor Cranes

Though quite different from the jib cranes and overhead crane described, the portable yard cranes shown in Figs. 15 and 16 take advantage of the same elements of superiority in design and materials. The smaller one (Fig. 15) is no more than a standard farm tractor specially modified for the task of carrying wheels with mounted tires to large machines stocked in the yard. The small, rubber tired tractor was converted to its specialized job by simply welding to the tractor frame the base plates for the front and rear booms and the accessory cable-aligning frame.

These units were cut from steel plate. A standard, all-welded power control unit was attached to the rear of the tractor, and the welded front and rear booms were hinged to lugs that had been welded to the base plates. Welded hoist blocks and a cable from the power control unit were connected to each hoist boom to complete the mechanism. The cable was guided and lined up by sheaves with all-welded housings which were themselves welded to a rigid, lightweight supporting frame of welded box sections.

The crane in Fig. 16 is one of several standard tractor cranes for general heavy hoisting and moving. Its simplicity, light weight, strength and adaptability are largely due to its all-welded construction. It has a lifting capacity of over 20 tons and takes its power by means of an all-welded power control unit on the rear of the tractor.

These cranes for yard service answer the needs for hoisting, handling and hauling around the factory. Both are made possible in their effective form by the ingenuity of the designer and the economy of welded steel design and construction.

A Real Economy

On the basis of the function of these several examples of arc-welded units for factory transportation and handling, the conclusion becomes inescapable that the application of welded design and fabrication to factory transportation and handling equipment results in a very real economy in each of the basic items of cost.

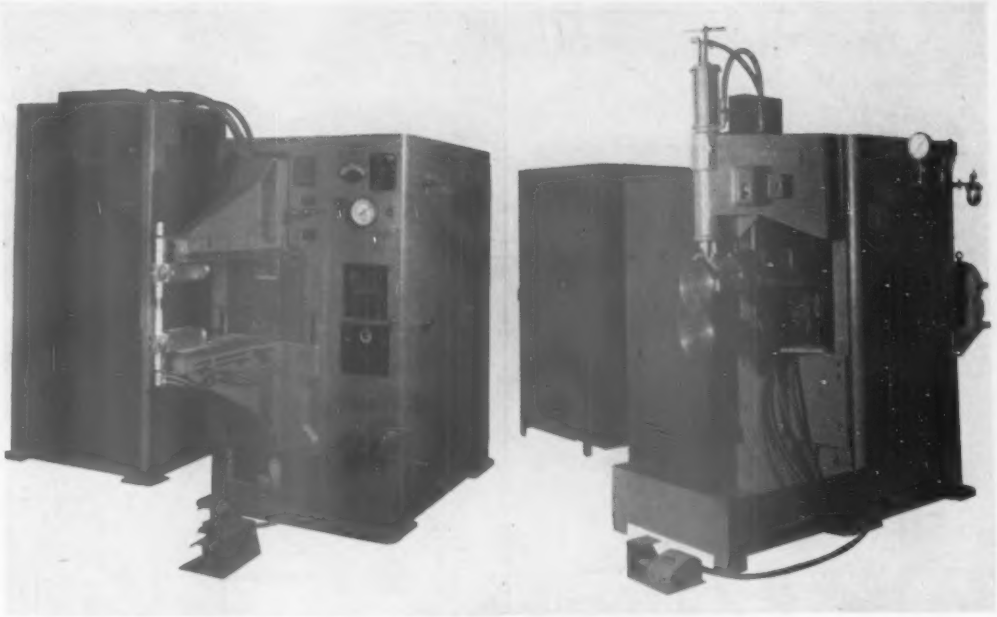
The cost of materials and labor in the actual production of the unit is less than the other common methods of making such equipment. The serviceability of the unit, its long life and small maintenance costs effect other very important economies. The most efficient use of factory space is made possible by the simplicity and compactness of the design. The small total volume of the material used, the freedom from obstructed or reinforced corners on the unit, the easy mobility, all serve to reduce the cost of occupied factory space to a minimum.

In addition, the welding process allows the shop man to use his natural ingenuity to design and build specialized units in steel at a sufficiently low cost to be a real source of savings. These various items of economy are all very potent reasons for making and using welded factory transportation and handling equipment.

THE END

Fig. 16—A heavy service tractor crane used in the factory storage yard. It is capable of lifting, transporting and accurately placing large loads.

★ RESEARCH



Spot and seam welders. Methods of supplying power to such machines as these divide into two basic types—direct energy and stored energy.

Power Systems for Resistance Welding

In view of recent developments, Mr. Cooper feels that the following analysis will help those who would like to familiarize themselves with the various electrical systems for resistance welders and their applications.

By **J. H. COOPER**

Chief Sales Engineer,
The Taylor-Winfield Corp.

THE problem of supplying energy for resistance-welding machines without causing undue disturbance to the power system is basically an electrical one and, as such, is difficult to fully comprehend without a careful analysis. This has resulted in the problem becoming shrouded with mystery and the promotion of many schemes which do not fundamentally solve the difficulty.

Methods of supplying power to welding machines may be divided into two basic types. One is the stored-energy type, which takes a major portion of the energy from the power supply during the interval between successive welds, and the other is the direct-energy type, which takes energy from the power supply only during the interval while the weld is being made. There is an incorrect tendency to assume that only single-phase alternating current is used for direct-energy types and that only direct current is used for stored-energy types.

Kva and Kw

In all electrical systems, the load-carrying ability of electrical equipment is determined by its temperature rise, dependent upon the current which is flowing. Ratings to electrical equipment in terms of current only, however, would not completely describe the load requirements of the equipment involved. For resistance welders, therefore, a standard practice has been adopted of using the product of the voltage and current, commonly known as kva (volts x amperes ÷ 1,000) as a measure of the load requirements. Hence we may speak of the power demand of the welding machine in terms of kva and it will not be necessarily different regardless of the value of the line voltage. Kva power demand, however, does not represent the true energy demand, which also depends upon the phase displacement of the current and voltage, *i. e.*, power factor. The product of the kva and the power factor results in kw or kilowatts, the true energy demand.

First Basic Principle

In direct-energy welding machines, there is no method by which the kw or energy demand drawn by a specified welding machine to produce a specified secondary current can possibly be reduced.

The above basic principle should be thoroughly understood. It is based upon what scientists call the law of conservation of energy, which states that energy can be neither created nor destroyed but only changed in form. If a certain amount of heat energy is required to make a weld, we must put into the welding machine an amount of electrical energy exactly equal to this heat energy plus the losses in the machine. Since the rate of energy consumption is fixed by the specified secondary current, the kw demand, therefore, is automatically determined. Of course, this total can be reduced by a more efficient design which would reduce the machine losses, but that is a different sort of thing entirely. In the use of a-c direct-energy resistance welders, there are various means by which the kw demand may be taken, either uniformly or non-uniformly, from a three-phase system, but these means do not reduce the demand rate itself.

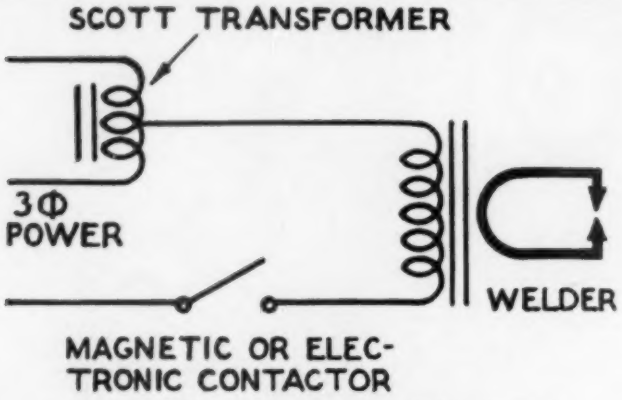


Fig. 1—Scott transformer connection used to operate single-phase welders on three-phase power supply.

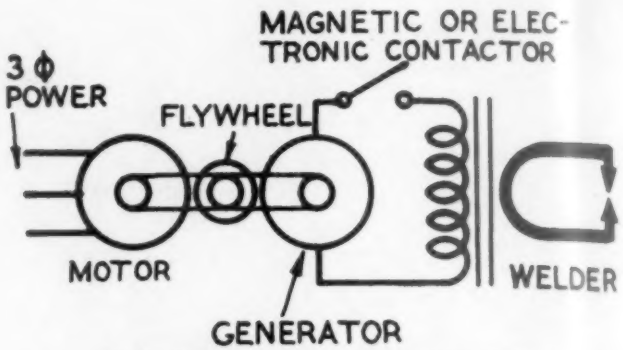


Fig. 3—Motor-generator set used to operate single-phase welders on three-phase power supply.

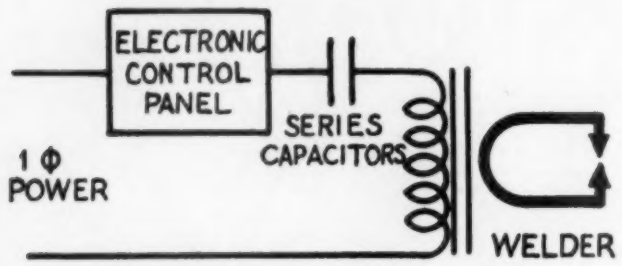


Fig. 2—Series capacitors used to reduce power demand of welders on single-phase supply.

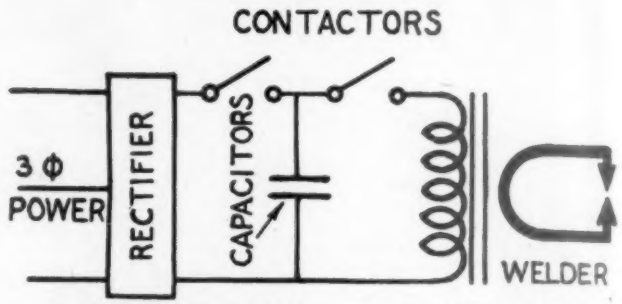


Fig. 4—Electrostatic stored-energy circuit for resistance welders.

Phase Conversion

Uniform conversion of three-phase power to single-phase power is impossible without the use of energy-storing devices.

Truth of the above is due to the fact that the instantaneous power in a single-phase system is zero every half cycle, while in a three-phase system there is never an instant at which the power is zero. To convert from one to the other, the power existing in a three-phase system at the time the single-phase power equals zero would have to be stored by some means and subsequently delivered to the single-phase load during the normal periods of zero power.

A common form of such energy storage is an induction-motor-driven motor-generator set in which *balanced* three-phase power is delivered to the motor and uniform single-phase power is delivered from the generator. The storage is accomplished by the mechanical energy stored in the inertia of the rotating parts, commonly referred to as the "flywheel effect."

Transformer Systems

There is no straight transformer arrangement which will convert a single-phase load to a balanced three-phase load.

The reason for this is apparent from the preceding basic statement and its explanation. There are, however, many different methods of obtaining a single-phase voltage from a three-phase system by using transformers which result in *varying* distributions of current in the three-phase equipment.* Of all these connections, the Scott (Fig. 1) is the most suitable for use in conjunction with welding machines. Test data taken for one installation showed that if a straight single-phase connection resulted in 4% line voltage drop during the weld on the one leg of a three-phase line to which the welder was connected, 2% on one of the other legs and 0.5% on the third leg, the use of an auxiliary Scott transformer and connector would result in aproximately a 2% voltage drop on two legs and practically zero drop on the third leg. It can be seen from this that the voltage drop on the line to which the welder was connected was cut in half, a considerable improvement.

This does not and cannot result in a *balanced* three-phase load, however. The single-phase voltage applied to the welder from the Scott transformer is 0.866 times the standard line voltage; to obtain proper output, therefore, welding transformers must be especially wound to operate on 86.6% of the line voltage, and welding power control equipment of the synchronous type must be operated from the same reduced voltage. Relay equipment may be operated directly from one leg of the three-phase supply line.

* See pages 34-35, General Electric publication, GET-2A, "Transformer Connections."

Use of Series Capacitors

Series capacitors may be used to reduce the welder kva demand to a value approximately equal to the kw demand.

The above is accomplished by effectively cancelling out the inductive reactance of the welding machine with a capacitative reactance (Fig. 2) and consequently increasing the power factor to approximately unity. As previously pointed out, the absolute minimum value to which the kva demand may be reduced is the kw or energy demand.

Series capacitors do not constitute a stored-energy system. This equipment is in general technically satisfactory for application to all types of resistance welders except flash welders or welders subject to a wide range of resistance variation such as is obtained from spot or projection welds in series.

In installations where the power factor is low and the fundamental reason for wanting power factor correction is to minimize light flicker, series capacitors not only produce approximately unity power factor but also reduce the total kva demand to the minimum value of the kw demand and produce the best voltage regulation at the welder.

Tube Turns' Complete Line SAVES A LOT OF "SHOPPING AROUND"

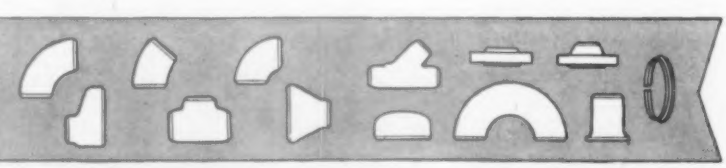
There are more than 4,000 items in the complete line of Tube-Turn welding fittings. There are Tube Turns distributors in all principal cities and every one of them carries a comprehensive stock. You save time and money by being able to get *all* the welding fittings you need from a single source. When you choose Tube-Turn welding fittings, you get action.

Tube-Turn welding fittings were the *first* seamless welding fittings. Today's complete line is the product of many years' successful experience. That experience is available to you through Tube Turns distributors. They can be of real help in solving knotty problems—and behind every distributor stands the nearest Tube Turns branch office, backed up by the home office engineering staff.

Get acquainted with your Tube Turns distributor. He can help you out of many a tight spot. And write today for your free copy of the new Tube Turns Catalog No. 111, a valuable handbook of welding fittings information.

Selected Tube Turns Distributors in every principal city are ready to serve you from complete stocks.
TUBE TURNS (Inc.), LOUISVILLE, KENTUCKY.
Branch Offices: New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Houston, San Francisco, Seattle, Los Angeles.

TUBE-TURN
TRADE MARK



THE COMPLETE LINE OF WELDING FITTINGS AND FLANGES

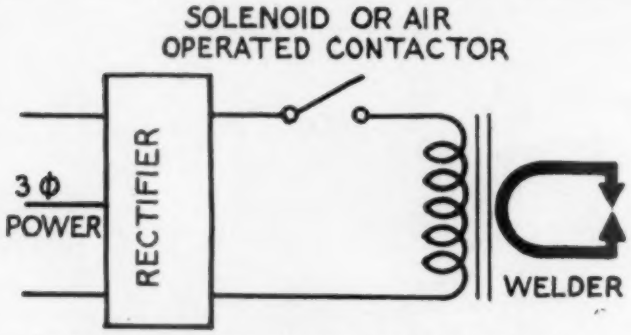


Fig. 5—Electromagnetic stored-energy circuit for resistance welders.

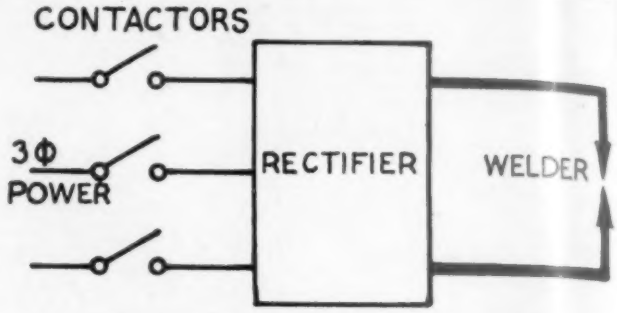


Fig. 6—Direct rectifier system used to operate resistance welders on three-phase power supply.

Motor-Generator Sets

A welder kva demand may be converted to a balanced three-phase load equal to its kw demand by the use of a motor-generator set with a synchronous motor.

This type of installation is still in the class of a direct-energy welder. A synchronous motor cannot change its speed and hence cannot store and deliver energy over a relatively long period of time during rise and fall of rotating speed as can an induction motor. The motor can be operated at unity (100%) power factor, however, by adjusting its field. The system is only of academic interest since it is practically never used.

Welder kva demand can be reduced to a relatively low, balanced three-phase load by use of a motor-generator set driven by an induction motor having a high-resistance rotor.

This type of installation (Fig. 3) is a true stored-energy system. Part of the energy is stored mechanically in the rotating parts, which often include an actual flywheel. When the weld is made, the mechanical energy stored in the flywheel is converted by the generator to electrical energy and delivered to the welding machine to supplement the energy drawn from the power supply while welding. The energy loss from the flywheel results in a reduction of its speed. Between the end of one weld and the start of the next, the flywheel is returned to its initial speed by the motor. The time interval during which the motor is to bring the flywheel back to initial speed may be very long compared with the weld time; hence the demand on the power supply line can be quite low.

Electrostatic Storage

In welding operations requiring relatively small demands of total energy, both the kva and kw demand may be reduced by the use of an electrostatic stored-energy system.

The electrostatic stored-energy system consists of a full-wave rectifier which draws power from the a-c line, rectifies it to direct current and charges a bank of capacitors, thereby storing energy in them. The energy is discharged from the capacitors through the welder into the work, thereby making the weld. The time of storage is relatively long and takes place between successive welds, the time of which is relatively short. Therefore, we have a true stored-energy system. It greatly reduces both the kva and kw demand since the great difference between the time of storing and the time of welding permits the energy to be absorbed from the line at a very low rate.

This system is usually restricted to welding conditions which require the energy to be delivered at a high rate for a comparatively short time. It is somewhat impractical to obtain a relatively long time of current flow from capacitors. This system is particularly advantageous for the welding of alloys of aluminum, magnesium and copper since the high electrical and thermal conductivity of these materials make it necessary to have a high rate of energy input for a relatively short time.

The electrostatic system may be operated from either single-phase or three-phase power supply lines. It is a 100% stored-energy system; *i. e.*, the total energy needed for a weld is completely stored before the start of the flow of welding current. A further advantage is that variations in the power supply voltage do not affect the amount of total energy stored for each weld. The power demand rate for this type of welder does not vary with the speed of operation and is the lowest constant demand rate required by any of the systems discussed in this article.

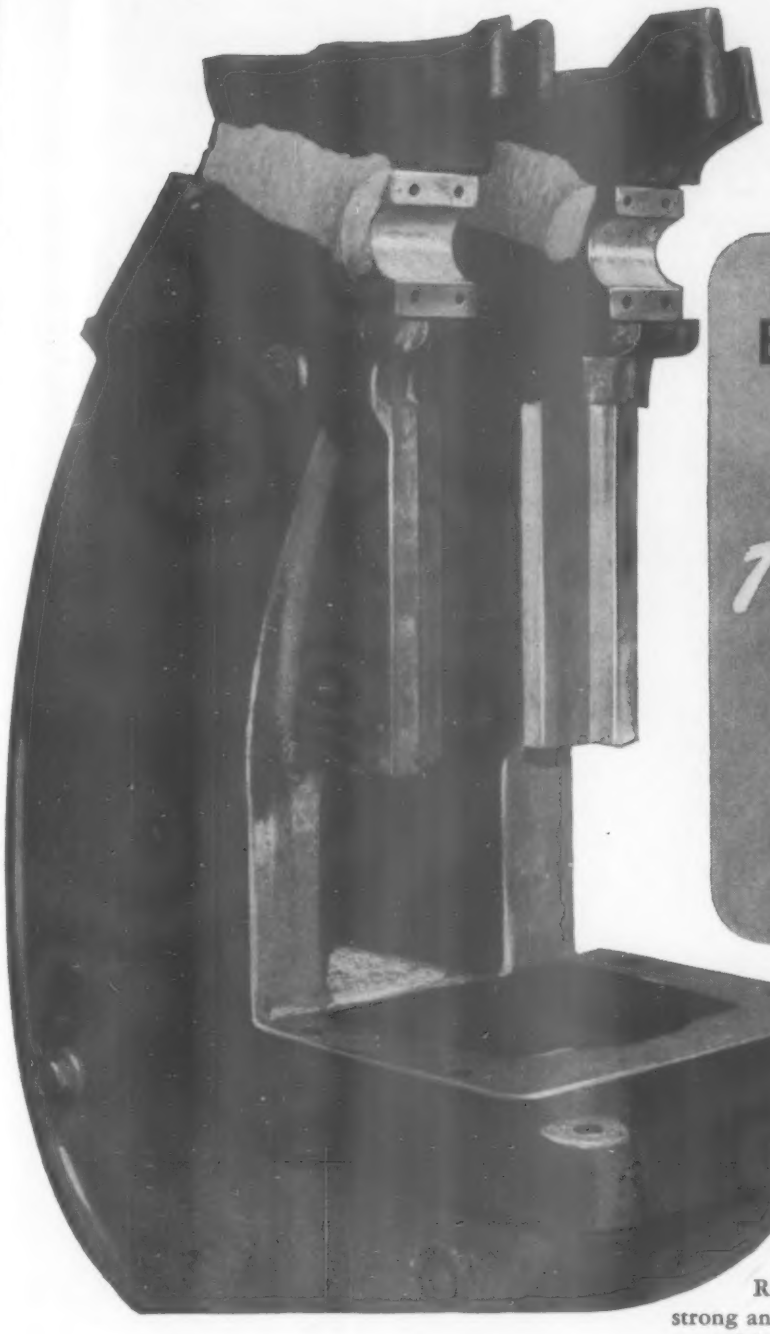
Electromagnetic Storage

In welding operations requiring relatively small demands of total energy, both the kva and kw demands may be reduced by the use of an electromagnetic stored-energy system.

This system (Fig. 5) draws a-c power from the power system, rectifies it to direct current with a half-wave rectifier and allows the rectified current to flow in the primary winding of a special transformer, thus storing energy electromagnetically in the transformer. During the storage process, a certain amount of energy is generally delivered directly to the weld, since the storage takes place with the welding electrodes in contact, and the charging current in the primary causes the current to flow in the secondary. At the end of the storing operation the primary circuit is interrupted by a solenoid or air-operated mechanical contactor, and the stored energy discharges into the weld.

As in the electrostatic system, the storage takes place over a relatively long period of time as compared with the welding time. Hence the demand is substantially reduced. The system is not a 100% stored-energy system since a portion of the weld energy is generally drawn directly from the line during the storing operation. This tends to preheat the work and electrodes; the preheating may be a handicap in the case of aluminum welders by causing more electrode pick-up and greater electrode heating.

Unlike the electrostatic system, the entire time between welds cannot be used for energy storage, since the electrodes must generally be in contact during both the storage and welding periods. To partially compensate for the reduction in operating speed caused by the usual practice of storing energy with the electrodes in contact, the rate of storing energy and hence the power demand are increased. Furthermore, the power demand required by the half-wave rectifier is in excess of that required by a full-wave rectifier for a comparable application.



Busy on Bomb Parts, Fractured... TOBIN BRONZE WELDED in 22¼ Hours

ANOTHER EXAMPLE of how Bronze Welding is helping keep vital production tools in action, is this punch press used in producing bomb parts.

Repairs to the cracked frame had to be strong and dependable . . . *and made with minimum delay.* So the Wayne Welding Supply Company, Inc. of Fort Wayne, Indiana used Tobin Bronze*. A total of 60 pounds of ¼-inch rod was required . . . and the work was completed . . . preparation, preheating, welding and finishing . . . in only 22¼ hours.

"Don't scrap it . . . Bronze weld it," is a slogan worth remembering. How to put it to work in your shop forms part of the practical information presented in Publication B-13. This publication also gives detailed information on the complete line of Anaconda Welding Rods. Write for your copy today. 45110

*Reg. U. S. Pat. Off.

What's YOUR experience with BRONZE WELDING?

Tell us what you've accomplished with Bronze Welding in the way of repairs, building up of worn surfaces, production operations, etc. We'll gladly publicize items of general interest for the benefit of all.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Keep Faith With Your Fighters and Yourself! Buy War Bonds

ANACONDA

Anaconda Welding Rods

Direct Rectifier, Batteries

Line demand may be reduced by the use of a direct rectifier to produce welding current.

Basically, this system (Fig. 6) consists of drawing power from the power supply through a three-phase, full-wave rectifier, converting the alternating to direct current and using the latter for welding. The system is of the direct-energy type as the energy is drawn from the power supply during the actual welding operation. The power demand can approach the minimum of the kw demand of an a-c machine delivering the same secondary current.

In welding operations requiring relatively small demands of total energy, the demand may be reduced by the use of an electrochemical (battery) system.

The battery system (Fig. 7) is a stored-energy type of system wherein the energy is taken from a single-phase or three-phase line and stored in a bank of battery cells. It is not a 100% stored-energy system since a portion of the weld energy is generally drawn directly from the line during the welding operation. Storage takes place continuously at whatever demand rate is necessary to keep the batteries charged. This system was used for many years in miscellaneous small soldering and welding operations, and it has lately been adapted to the welding of heavier sections.

Factors to be considered in a battery system are:

The difference in the time of storage and time of welding usually permits a reduction in the line demand as compared with a direct-energy system.

Sizeable charging units must be available if operated at other than low outputs and duty cycles.

Power demand is variable, increasing appreciably with speed of operation and as the batteries approach discharge.

A means of current interruption must be provided to handle directly the thousands of welding amperes. Precision timing of the means of interruption is not yet practicable as such systems involve air-operated interruptors.

The inductance of the welder secondary "loop" prevents obtaining of the steep current wave front so desirable for consistent high-quality welds in thin gauges of aluminum and nonferrous metals of similar weldability.

The battery will not withstand a full charge and discharge cycle each weld as will the electrostatic and electromagnetic systems.

Frequency Converter

Line demand may be distributed on a three-phase system and operate a single-phase welder by the use of a network of transformers and tubes to reduce the frequency of the single-phase power to the welder.

The frequency converter system (Fig. 8) is of the direct-energy type since the energy is drawn from the power supply during and only during the actual welding operation. The load taken from the three-phase system is not a balanced three-phase load but is instead the root-mean-square value of a succession of single-phase loads applied for equal intervals of time to each of the three phases. Such an unbalanced load is characteristic of the half-wave rectifier circuit, which is in quite common use for applications other than resistance welding controls. The demand on each phase of the three-phase power supply system is actually in excess of the demand which would result if the full wave were used to get the same welding current.

It is not possible for this type of system to reduce the total kva demand drawn from the power supply as low as it can be reduced by the use of series capacitors. Stated another way, this system cannot produce unity power factor, and in general its cost exceeds that of series capacitors.

Such systems apply a single-phase low frequency to the welder transformer, which frequency may either be fixed at a predetermined value or adjustable over a range of frequencies. The minimum frequencies applied may be as low as four cycles per second, and the maximum frequencies may be as high as 26 cycles per second. It should be realized that in some applications the lower frequencies are definitely unsuitable for making welds of highest quality. The reduction in steepness of wave front obtained with low frequencies makes the welding of thin gauges of aluminum difficult.

In all cases, the welder transformers operating on frequencies less than 60 cycles must be larger than 60 cycle transformers with the same numerical kva rating. In most cases the welder transformers must have a two-section primary winding in order to permit reversal of successive half cycles of input.

Controls external to the welder consist of five or six metal ignitron water-cooled tubes with a three-phase rectifier transformer as well as necessary control transformers, tubes, relays, etc. Tube replacement cost of these relatively expensive tubes is consequently greater than the cost of the two ignitron tubes used in standard a-c controls, either with or without series capacitors.

Conclusion

One basic fact should be kept in mind; *i. e.*, there is no one system which is the optimum under all circumstances. What system is optimum for particular conditions will depend upon the welding application, the power supply situation and the economies involved.

Each and every system described in this article has its own proper place, and only an expert analysis of all of the variables involved will result in the best decision as to which system should be used for a specific installation.

Fig. 7—Battery or electrochemical stored-energy circuit for resistance welders.

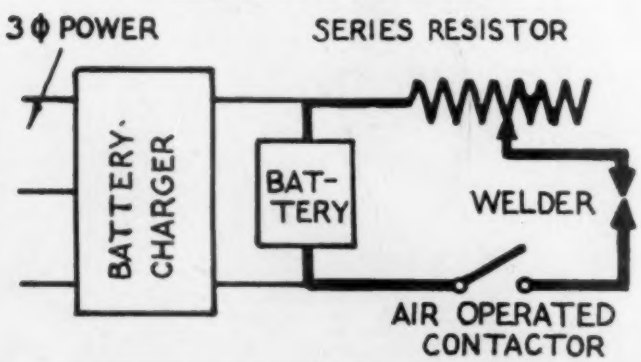
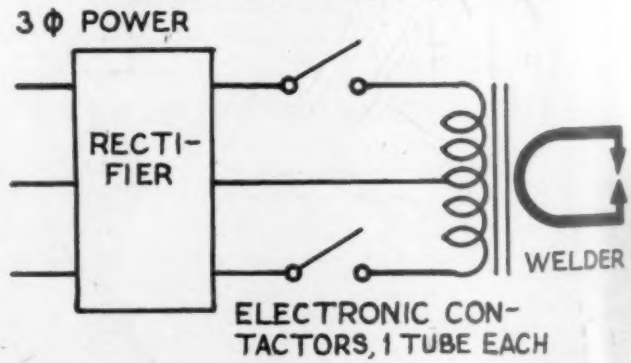


Fig. 8—Frequency converter system used to operate resistance welders on three-phase power supply.



New

MITT-GRIP" COLLAR

FOR WELLS' *Stubby* ELECTRODE HOLDER

Model 3R
300 Amp.

A new 4-cornered plastic collar that prevents the insulator from slipping in the mitt when changing rods, has been added to the Martin Wells *Stubby* electrode holder. It gives *Stubby* these additional features:

- Makes rod-changing *easier* and *quicker*, because it provides a positive, convenient grip on the insulator.
- Holds small rods upright and away from contact with work because corners of "mitt-grip" collar keep holder from rolling.
- Collar remains cooler than cap—making rod change comfortable.

Ask your local distributor for more details about the new Stubby with "mitt-grip" collar.

Exclusive Manufacturer

Martin Wells

5886 Compton Ave.,
Los Angeles 1, California

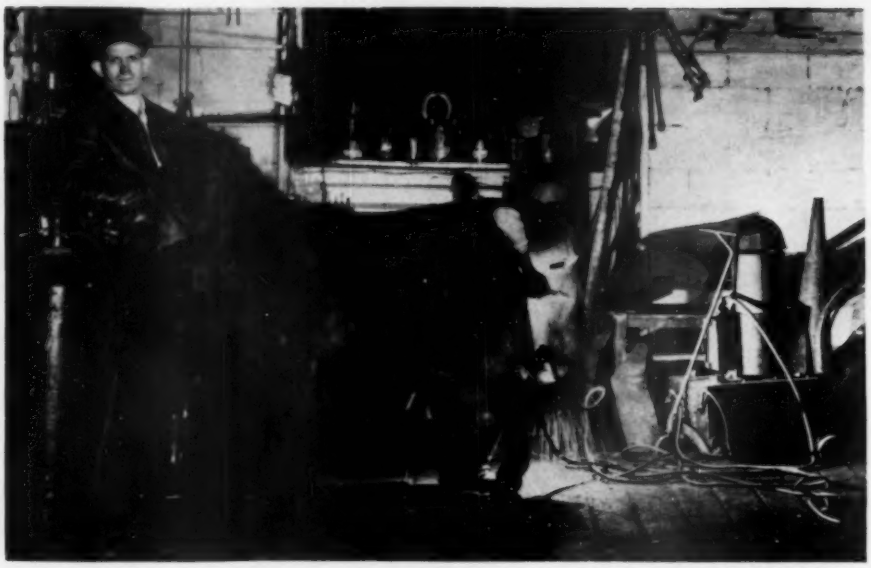
Bay City — Northern Supply Company
Birmingham — Ebbert & Kirkman Co. Inc.
Cedar Rapids — L. B. Lamb Sales Co.
Chicago — Steel Sales Corp.
Cincinnati — Williams & Co. Inc.
Cleveland — Williams & Co. Inc.
Columbus — Williams & Co. Inc.
Milwaukee — Steel Sales Corp.
Detroit — Steel Sales Corp.
Weldit Acetylene Co.
Houston and throughout Texas —
Magnolia Airco Gas Products Co.
Honolulu — Hawaiian Gas Products, Ltd.
Minneapolis — Steel Sales Corp.
Montreal — Rudel Machinery Co.
New York — Chicago Combustion Co.
Vancouver, B.C. — Scott-Foster & Co.
Omaha — The Balbach Company
Fuchs Machinery & Supply Co.
Phoenix — Arizona Welding Equipment
Pittsburgh — Williams & Co. Inc.
Saginaw — Northern Supply Co.
St. Louis — Steel Sales Corp.
San Francisco — Pitts & Loughlin
Spokane — Gibson Welding Supply Co.

AIR REDUCTION SALES CO. • OFFICES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES

On the Job

Arc-Welding Blacksmith

Now even the blacksmith's traditional horseshoeing methods have given way to arc welding. The arc-welding blacksmith shown in the picture below is Charles H. Chism, of Coshocton, O. To replace the



Courtesy, The Lincoln Electric Co.

Rebuilding the worn toe and caulk of a mine pony's shoe with arc welding. This new idea in horseshoeing was originated by Charles H. Chism, veteran blacksmith of Coshocton, O.

conventional forge and anvil, Mr. Chism has developed a neat technique for building up worn horseshoes without removing them from the horses' hoofs.

The shoe, Mr. Chism explains, does not get as hot during the welding process as it did when originally put on, for then it had to be red hot so that it could be shaped to fit the hoof. Nevertheless, horsy's footgear is cooled with water after the welding operation. For these horseshoe resurfacing jobs, Mr. Chism uses a lightly coated, ⅛ in. high-carbon electrode of the type designed to resist shock and abrasion. Old shoes can be built up a couple of times this way very nicely, he says.

Mr. Chism, who has been behind the anvil for 53 years, insists that horseshoers need not be afraid of applying the electric arc in this work. A long experience with the ways of horses is of course necessary. If the horse is of the high-spirited type that might shy from the flash, a blanket should be held over his head so that he will stand quietly.

» «

Machine Guns of Industry

In the hustle and bustle of the industrial front, in the clash of steel and the hum of motors, there is often a striking resemblance to activity on the battlefield. In the picture at the right the camera caught workers at Westinghouse Electric Corp. (formerly Westinghouse Electric & Mfg. Co.), East Pittsburgh, in the grim pose of soldiers and their weapons.

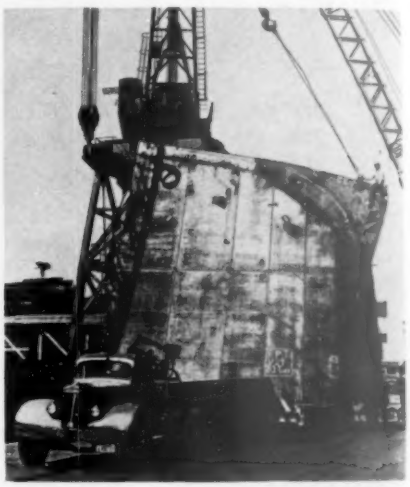
With the aid of some imagination, it is easy to see that the arc weldors in the picture are soldiers manning a pillbox, while the sparks streaming from the molten metal become machine-gun tracer bullets. The "pillbox," however, is merely the outside frame of a 60,000 kw hydrogen-cooled generator being built for a large eastern power company.

These workers and their machines may only look like soldiers, but their role in the war is hardly less important than that of real warriors. Welded products forced the arrogant Teuton to his knees to plead for mercy, and welded products will cause the final death rattle of the warlords of Nippon.

» «

Fast Ship Production

"Approximately 12 million deadweight tons of new ships will be built this year," Admiral Land, chairman of the Maritime Commission, revealed recently. This shipping is necessary to carry assault troops, the first supplies, replacements, food, medi-



Courtesy, The White Motor Co.

Moving a 52 ton welded forepeak section of a Victory Ship to the ways.

This "pillbox" on the industrial front is manned by two arc weldors at the East Pittsburgh works of Westinghouse Electric Corp. Note how closely the sparks resemble machine-gun tracer bullets.

cine, munitions—everything required to take and hold a beach and extend vast military operations inland.

Welding is helping to speed the construction of these ships by making possible the subassembly of very large units. The forepeak section of a Victory Ship shown in the picture (opposite page) weighs 52 tons. It was built up as a subassembly in the California Shipbuilding Corp. yard at Wilmington, Calif., and transported to the ways by a tractor and semitrailer. On reaching its destination, the forepeak will be welded to other subassemblies to build one more high-speed cargo carrier for our merchant marine.

» «

Slotted Guy Post

By Charles C. Lynde

THE weldor for an oil-drilling company found that a cutting torch solved his problem of segregating drill-rig guy wires on an anchor post.

The post is a section of extra-heavy pipe, slotted for some 18 in. on the side toward

Holes (not shown) were cut with a torch on the side of the anchor post opposite the slot. Each guy was then threaded through a hole and secured as shown.

the structure to be guyed. At the side of the post opposite the slot, the weldor flame-cut holes large enough to permit the passage of the guy lines, spacing them on 5 in. centers to afford the desired clearance between guys. After being passed through the slot, each wire was threaded through one hole and pulled tight. The tension was then maintained by taking a turn around the post and wrapping the end of the wire around the standing part.

The flame-cut holes keep the guy wires from working up the post and jamming at the top. They also make it easy to take up slack in any one line without interference with the others.

HERE'S WHY WELDERS PREFER TO USE . . .

TITAN
Bronze welding rods

- Double Deoxidized (an exclusive TITAN process) to Produce Ductile, High Strength, Non-Porous Welds.
- Uniform and Easy Tinning
- Low Melting Point
- Good Machinability of Deposited Bronze Alloy in Weld.
- Good Resistance to Corrosion.
- Low Fuming—A Comfortable Atmosphere for the Welder.

Titan Bronze Welding Rods Are Available in the Following Grades:

GROUP I—General purpose rods particularly recommended where high strength and ductile welds are required.

PENN BRONZE • TITAN BRAZING BRONZE

GROUP II—Manganese bronze rods for higher physical properties. General purpose rods recommended for Cast Iron, Cast Steel, other ferrous and some non-ferrous alloys.

TITAN MANGANESE BRONZE • TITAN NAVAL MANGANESE BRONZE

GROUP III—Tin Bronze rods that work very well on cast iron, as well as on other ferrous and some non-ferrous alloys. The welds have good corrosion resistance.

TITAN BRONZE • TITAN NAVAL BRONZE • TITAN WEARWELL

Write for Detailed Information

Titan

METAL MANUFACTURING CO., BELLEFONTE, PA.
NEW YORK • CHICAGO • NEW ORLEANS • SAN FRANCISCO

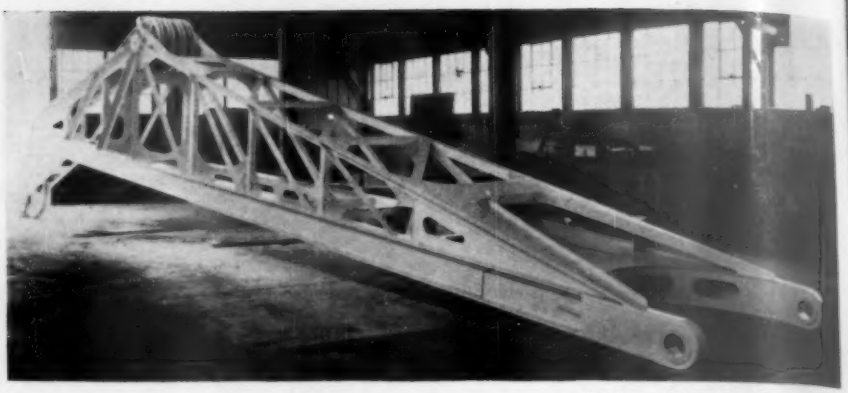
Quality Alloys By Brass Specialists
Brass and Bronze Rod • Forgings • Die Castings • Welding Rods

Welded Booms for Warships

By S. Craig Cairns

ARCHITECTURAL Steel Engineering Co., Inc., Philadelphia, was called upon to redesign a 35 ton crane boom used for loading trucks onto warships. The weight of the boom had to be kept to a minimum in order to permit additional tonnage of supplies to be carried overseas.

To lighten the weight of the boom without sacrifice of the necessary strength and rigidity, the final design specified welded fabrication. The numerous gussets, stiffeners, bracket plates, box compartments and doubling plates utilized on this job required hundreds of feet of first class Navy welding. The biggest problem, of course, was to keep the booms straight, and the weldors—Joe Latini, Stanley Potemski and John Di Joseph—did a superb job.



Courtesy, The Hobart Brothers Co.

Welded boom for a ship crane. It saves weight, permits additional tonnage to be carried.

The tolerance allowed on the bushings (of which there are four sets) was less than ⅛ in. This did not allow any extensive warpage or twisting in the 50 ft length of the boom.

The completed booms weighed over 23,000 lb each and took approximately 300 hr of welding time. Between 800 and 900 lb of 5/32, 3/16 and ¼ in. electrodes were used.

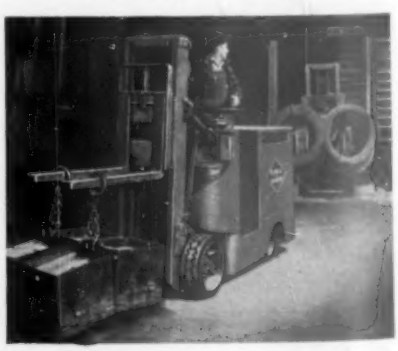
» «

Handling Welding Wire

A MANUFACTURER of welding electrodes receives each day an average of 250,000 lb of unfinished wire in coils to be processed, boxed and shipped. Two fork trucks handle most of the raw materials and finished products.

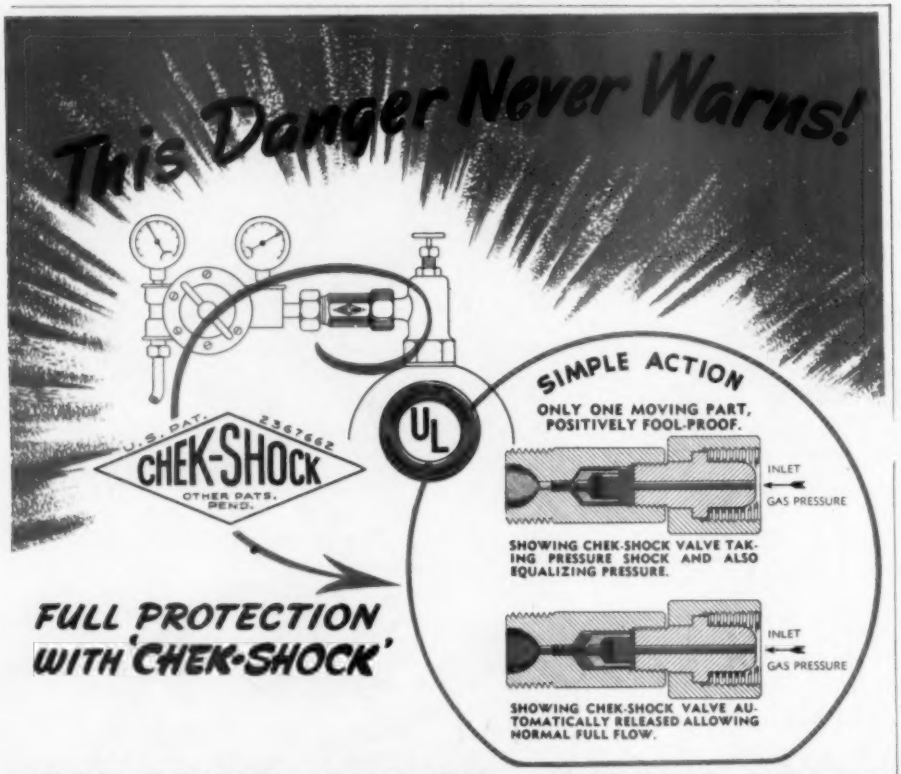
The coils are first stacked almost vertically side by side in the freight cars. Each of a truck's two prongs then engages five coils of wire. The ten coils, collectively weighing two tons, are lifted at one time and conveyed 100 ft to receiving bins. Adjacent machines straighten the wire, cut it to length and eject the rods into steel boxes.

The boxes have holes pierced near their upper edges for hooks. The two-pronged fork lifts four boxes of cut rods at one time by means of the hooks and short lengths of chain (see picture below). The rods are taken to an extrusion press and given their flux coatings. Later the same trucks are used in the conventional manner to lift the packaged rods on pallets or skids and transport them 100 ft to cars or storage.



Courtesy, The Elwell-Parker Electric Co.

Quick transportation of coiled wire and cut rods for electrodes is provided by fork trucks.



CHEK-SHOCK OXYGEN CUSHION VALVE

SOFTLY controls the vicious "jolt" of high pressure oxygen gas, thus eliminating regulator repairs and preventing possible injury to operators.

- **Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.**
- **Will increase life of regulator assembly.**
- **Will eliminate possible injury to operator from burstings.**
- **Will prevent unnecessary internal wear in regulator *(as NOT necessary to release control screw before opening tank valve).***

This PROVEN automatic safety device cushions the initial "blast" of pressure when tank valve is turned on, (this uncontrolled surge which strikes like a hammer is the direct cause of most damaged regulators and accidents), when pressure slowly bleeds and equalizes then CHEK-SHOCK allows a full flow of oxygen.

PRICE IS LESS THAN ONE REPAIR BILL

 # 1. STANDARD COUPLER—for all standard size welding type oxygen regulators.
 # 2. LIGHT COUPLER—for "airplane" or soldering size oxygen regulators.
 # 3. HEAVY DUTY COUPLER—recommended for extra heavy duty work only.
 # 4. SCREW TYPE COUPLER—for removable inlet stem regulators (¼" pipe) available in standard, light, or heavy capacities.
$6.00 ea.
 # 5. FOR HYDROGEN—left hand thread coupler. We also make Medical Chek-Shocks for all types of medical regulators and tank fittings (chrome plated).....$7.00 each

SEE YOUR DISTRIBUTOR OR WRITE

Chek-Shock MFG. CO.
FOWLER CALIF.

Rising Star

The habit of constantly TRYING leads to the habit of SUCCEEDING, as every parent—and every businessman—knows. It is this "habit of trying" . . . and succeeding . . . on the part of Hewitt's rubber engineers that has led to so many advancements in rubber for industry . . . that led to Hewitt's successful development of SYNTHETIC compounds 14 years ago . . . at a time when they were just a "gleam in the eye" of most manufacturers now producing them.

This priceless "plus" of constantly trying . . . of usually succeeding . . . means industrial rubber products designed to DO your job BETTER . . . do it LONGER . . . COST LESS per working hour.

★ ★ ★

Specify "Hewitt" for quality industrial rubber products. Phone the Hewitt distributor listed in the Classified Section of your telephone directory . . . or write Hewitt Rubber Corporation, 240 Kensington Avenue, Buffalo 5, New York.

HEWITT RUBBER *of Buffalo*

Job-Engineered Industrial Hose • Belts • Molded Goods

QUALITY RUBBER PRODUCTS FOR INDUSTRY FOR 85 YEARS

Short Cuts and Kinks . . .

Help Speed V-J Day

A few of the many time and labor-saving ideas developed by tacticians of the production line are presented every month in this department. If you have a good welding idea of your own to pass along, you are hereby invited to contribute it to the cause of final victory. Send anything you think suitable to: Short Cuts and Kinks, THE WELDING ENGINEER, 506 S. Wabash Ave., Chicago 5.

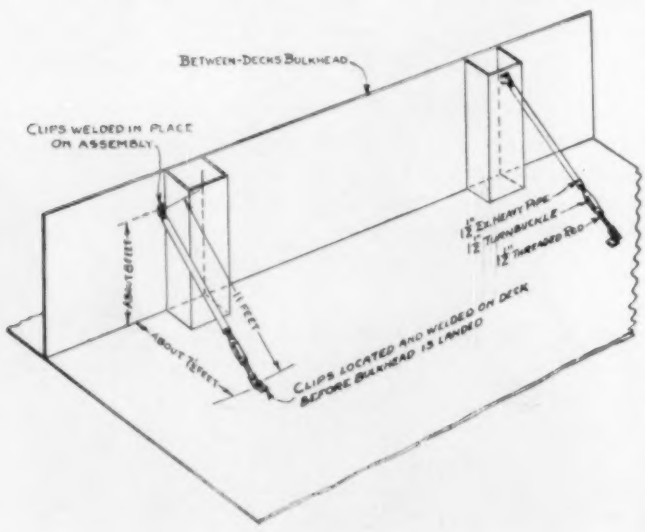
Bulkhead Shoring

By Donald Dietrich

AT RICHMOND Shipyard No. 1 miscellaneous bulkheads were usually supported after they were landed by using flat bar shores which had been welded to the bulkheads and deck at several points along their breadth. Since the flat bars were often bent during the course of construction, the bulkheads were pulled off declivity and might be welded permanently in the wrong positions. In addition, shipwrights usually had to wait until a weldor could be obtained to weld the clips into place; the delay not only wasted the shipwright's time but also held up the crane.

In order to speed up the landing process, I suggested that substantial shores, all of uniform length, be constructed of extra-heavy pipe and threaded rod. These can be immediately bolted into place as soon as the bulkhead is landed. The clips, both on the bulkhead and the deck, can be spotted and welded long before the bulkhead is set, thus requiring only the attachment of the shores to the hull.

The suggestion was accepted by our Labor-Management Committee. The adoption of the idea has saved us about 10½ man-hours in the landing and setting of each between-decks bulkhead—a total of 62½ man-hours per hull. About 20 shores are required for each hull.


BETWEEN-DECKS BULKHEAD
CLIPS WELDED IN PLACE ON ASSEMBLY
ABOUT 11 FEET
ABOUT 11 FEET
CLIPS LOCATED AND WELDED ON DECK BEFORE BULKHEAD IS LANDED

Shores for between-decks bulkheads. Clips are welded to the bulkhead and the deck and the shores can be bolted into place as soon as the bulkhead is landed.

» «

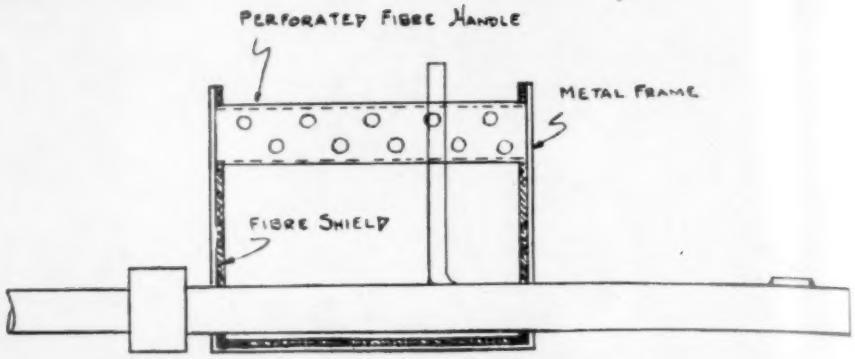
Electrode Holder

By Timothy F. Herlihy

I HAVE designed an arc-welding electrode holder with a handle that remains cool. This holder has been adopted by the Labor-Management Committee of the M. W. Kellogg Co., Jersey City 3, N. J. It will not become heated regardless of the length of time in service, size of rod or amperage used.

This holder will save the greatest time when used with large rods, welding with 300 to 400 amperes. With any rod or amperage, however, it can be used for eight hours of continuous work without undue heating. Construction is indicated in the accompanying sketch. It differs from most electrode holders in that the current is not carried through the handle.

Ordinarily, weldors are compelled to stop work from time to time on account of the discomfort caused when the handle becomes hot. The use of my holder is estimated to save at least 20 min to ½ hr per day per man in lost welding time. From this it readily can be seen that a great many man-hours will be saved when the device is used on continuous high-amperage welding by thousands of weldors. In our own plant, the saving in man-hours, at the rate of 20 min a day per man, would be a total of at least 3,000 man-hours per year.



Electrode holder. This design does away with hot handles, its inventor claims.

» «

Grinder Support

By R. H. Emtelman and P. Lane

TO GRIND overhead weld deposits on the bottom of a ship's shell plating is a very tiring job. Grinders' arms become fatigued, and they must frequently take time out to rest. Hence the painters and other craftsmen who follow the grinders are sometimes held up in their work.

Telescopic support for grinding overhead welds on the bottom of shell plating.

To overcome this difficulty and its resulting delays, we suggested a telescopic device for supporting a portable grinder for overhead work. This suggestion was accepted by the War Production Drive at Richmond Shipyard No. 1. The device, shown in the accompanying illustration, permits the operator to grind continuously without experiencing arm fatigue. The quality of the work is greatly improved, and the worker is capable of turning out more work during the shift.

The telescopic support will accommodate varying heights in the shell plating above the shipways. The cost of construction is quite nominal, and the support is estimated to save 32 man-hours per shift or 96 man-hours per three-shift day.

"MAJOR" WELDING CABLE—

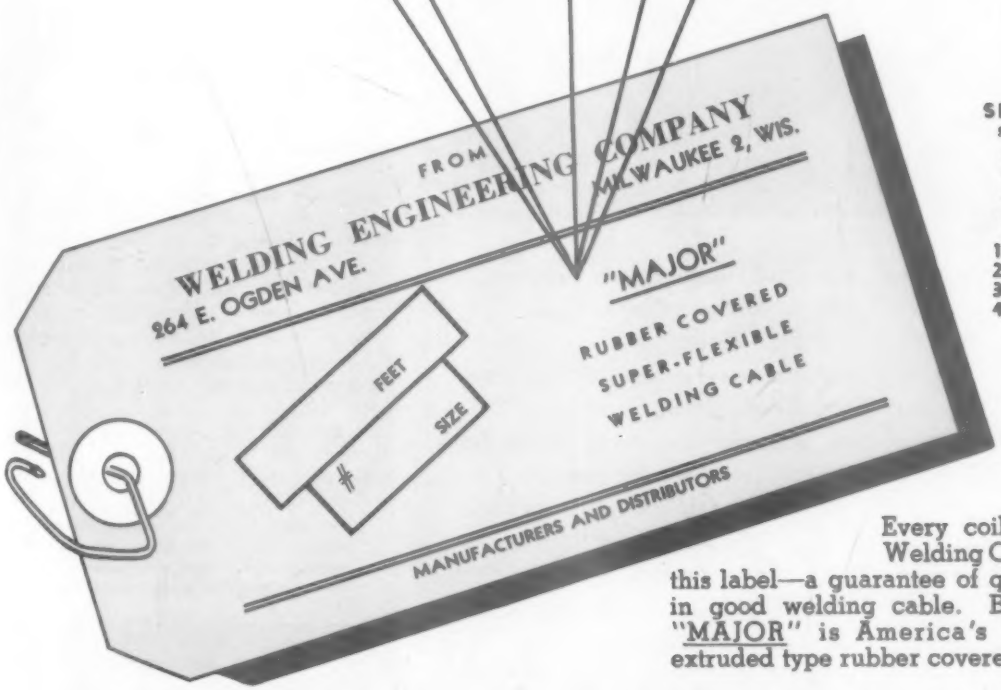
Super Flexible

Waterproof

Oil Resistant

Rubber Covered

Durable



SIZES AVAILABLE:

Size	Strands	Amps.
6	950	75
4	1029	125
3	1323	150
2	1666	200
1	2156	250
1/0	2646	300
2/0	3381	375
3/0	4284	450
4/0	5376	550

Every coil of "MAJOR" Welding Cable sold carries this label—a guarantee of qualities essential in good welding cable. By national poll, "MAJOR" is America's "First Choice" extruded type rubber covered welding cable.

AMERICA'S FASTEST SELLING WELDING CABLE

WELDING ENGINEERING COMPANY
MILWAUKEE, WISCONSIN
MANUFACTURERS—DISTRIBUTORS
OFFICES AND AGENTS ALL OVER THE UNITED STATES

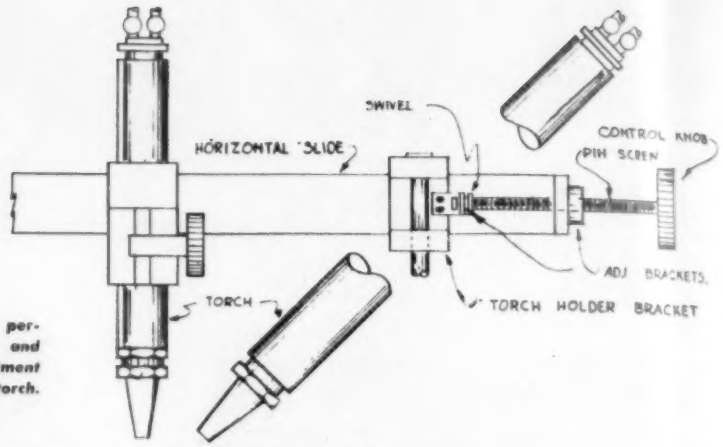
Cutting-Torch Holder

By C. R. Hankins

IT WAS a common but bad practice to use a hammer to force the flame-cutting torch-holder bracket to a desired position. The hammering would loosen all adjustments on the cutting machine, causing it to run untrue, and would also cause much damage to the machine parts.

I suggested a simplified torch holder to the War Production Drive Committee at the Kaiser Co. yard, Portland, Ore. This consisted of a torch-holder bracket on the horizontal slide arm with a pin screw adjustment to allow quick and easy adjustment of the bevel torch.

This torch-holder bracket permits close limit setting with minimum time and effort and eliminates all need for hammering the torch into position. While it is extremely difficult to estimate exactly how many man-hours are saved on a device of this nature, it is generally acknowledged that its use is well worthwhile in the fabrication as well as in the maintenance and repair departments.



A pin screw permits quick and easy adjustment of the bevel torch.

Good Arc-Welding Calls For Sensitive Governing

● Engine-driven arc-welding equipment calls for the most sensitive kind of governing . . . the kind that allows no perceptible lag between striking of the arc and complete recovery of current characteristics.

That is precisely the kind of regulation Pierce Flyball Governors give. That is the reason Pierce Governors—accurate, instantly responsive, completely dependable, long-lived units—built by the world's largest governor manufacturer—are standard equipment on the finest of engine-driven welders.

Pierce Governors are precision instruments—acting on the time-proved *centrifugal* principle. They do not gum or stick. They frequently outlast the engines they regulate—with complete freedom from trouble. Specify Pierce Governors on the new welding equipment you buy—and write for full particulars and the Pierce Governor catalog if your present welders are not Pierce-governed.

THE PIERCE GOVERNOR COMPANY, INC.
1607 OHIO AVENUE • ANDERSON, INDIANA
Manufacturers of
Pierce Precision Governors and Sisson Automatic Chokes

PIERCE GOVERNORS

» «

Aid to Thermit Welding

By Albert Pinard

IT HAS been a custom to weld preheating-torch support arms to the thermit-welding mold boxes used at the Walsh-Kaiser yard at Providence, R. I. To remove these arms, it was necessary to break them off and chip away the remaining weld bead. This seemed to be a needless waste of energy, so I suggested to our War Production Drive Suggestion Committee the use of detachable supporting arms. The suggestion was adopted, and we now insert the tongues of the arms (four angles) into flat clips welded to the side of the mold box. Thus the arms may be readily removed or as quickly connected to provide convenient supports for the heating torches.

By eliminating the welding of arms and the subsequent chipping, this suggestion saves about two man-hours of each thermit weld. In the yard where this suggestion was adopted, there have been to date 34 thermit welds, so we have saved 68 man-hours as well as much waiting time.

Detachable rests for the preheating torches used in thermit welding. The tongues on the arms are inserted into flat clips welded to the mold boxes.

Resistance Welding Dos and Don'ts*

DOs

1. Use the proper electrode material for the job you are doing.
2. Use standard electrodes wherever possible.
3. Use the most suitable tip diameter for the thickness of the stock being welded.
4. Connect the water inlet hose to the proper holder inlet so that water flows through the center cooling tube first.
5. Cool spot-welding tips internally with cool water flowing at a rate of at least 1½ gal per minute through each tip.
6. Be sure that the internal water-cooling tube of the holder projects into the tip water hole to within ½ in. of the tip-hole bottom.
7. Be sure that the top of the adjustable water-cooling tube in the holder is cut at any angle to avoid jamming the tip down and shutting off the water.
8. Place a thin film of cup grease on the tip taper prior to inserting it in the holder. This will make it easier to remove.
9. Use ejector-type holders for easy removal of tips and to avoid damage to tip walls.
10. Keep the tip taper and holder taper clean, smooth and free from foreign deposits.
11. Dress spot-welding electrodes often enough to maintain weld quality.
12. Dress electrodes to their original contour in a lathe whenever possible.
13. Clean and tighten regularly all electrical connections in the secondary circuit.
14. Keep the welder throat area to the minimum permissible dimensions.
15. Lubricate the resistance welder's motor, gears and slides at periodic intervals.
16. Calibrate all pressure-applying mechanisms so that the exact welding pressure can always be known.
17. Clean—either chemically or mechanically—all material to be welded that has dirty, scaly, oxidized or otherwise contaminated surfaces.
18. Use suitable automatic current-timing devices.
19. Have all timing devices suitably calibrated.
20. Use synchronous electronic timing controls for short timing periods or in the welding of materials having critical weldability.
21. Mount timing devices rigidly to protect them from vibration or abuse and mount them for ready servicing.
22. Use synchronous controls, providing interrupted timing periods, in all seam-welding applications.
23. Use electronic or magnetic welding contactors developed specifically for welding applications.
24. When using an ignitron control with a welder drawing less than 40 amperes from the line, provide a load resistor across the primary so that the current does not fall below 40 amperes.
25. Keep all electrical contacts in relays, switches and contactors in good condition by frequent inspection and dressing or replacement if necessary.

DON'Ts

1. Never use unidentified electrodes or electrode materials.
2. Avoid special, offset or irregular tips when the job can be done with a standard straight tip.
3. Don't use small tips on heavy-gauge welding jobs, or large tips on small work.
4. Never use water hose that will not fit the holder water-connection nipples snugly.
5. Do not allow water connections to become leaky, clogged or broken.
6. Avoid using holders with leaking or deformed tapers.
7. Do not permit the adjustable water tube to be "frozen" by an accumulation of deposits. A few drops of oil periodically will keep the tube free.
8. Do not allow electrodes to remain idle for extended periods in tapered holder seats.
9. Don't use pipe wrenches or similar tools to remove electrodes.
10. Avoid the use of white lead or similar compounds to seal a leaking taper.
11. Never permit a spot-welding tip to mushroom enough to make dressing difficult.
12. Never dress electrodes with a coarse file.
13. Don't permit flash particles to accumulate on the welding transformer.
14. Do not use a long welder arm extension or a wide arm separation unless the shape of the parts to be welded necessitates it.
15. Shun lubricants which are not recommended by the welder manufacturer.
16. Never permit sliding pressure members to become too tight or jammed since this will increase the frictional forces and inertia of the moving members.
17. Never weld unclean metals, scaly stock or metals with poor surface condition.
18. Avoid the use of slow-operating magnetic contactors if you are doing precision work.
19. Do not employ non-synchronous timing devices for welding materials with critical welding characteristics—*i.e.*, aluminum, magnesium and brass.
20. Avoid expensive synchronous timing devices for long timing, non-critical applications.
21. Don't use welding contactors or ignitron controls of capacity not within the rating of the welding machine and duty cycle of the application.
22. Never operate a synchronous ignitron control with the secondary of the welder open circuited.
23. Never use non-synchronous timing devices for short timing (less than 4 or 5 cycles).
24. Don't expect the timer to operate satisfactorily if the limit relay or switch in the timer-welder circuit chatters, or the contacts are oxidized or pitted.
25. Do not expect the timer to provide uniform timing pulses if the primary voltage regulation is poor. Ascertain timer manufacturer's recommended limits of voltage variation.

* From "Resistance Welding Data Book" published by P. R. Mallory & Co., Inc., Indianapolis, Ind.

DEADWEIGHT TAKES A K.O.—

N-A-X
LOW-ALLOY STEELS

when these FINE-GRAINED STEELS take over

In N-A-X low-alloy steels, manufacturers of mining equipment have what it takes to *knock out deadweight* in the design of cars, elevators, conveyors, tipples, screens and stripping shovels.

It's the old "one-two punch" proposition. N-A-X High-Tensile provides the extra strength in stressed members to permit more efficient design, lighter construction. N-A-X 9100 Series steels do the same for constructional parts that call for accurate heat-treatment, with abrasion-resistance an important factor.

Take advantage of the great strength, exceptional ductility, good corrosion-resistance, excellent weldability and high resistance to impact, wear and fatigue that these fine-grained N-A-X low-alloy steels offer. Put N-A-X High-Tensile and N-A-X 9100 Series steels on the job to cut down deadweight, step up payload and increase the life of your equipment.

GREAT STEELS FROM GREAT LAKES

GREAT LAKES STEEL
Corporation
N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION

★ PRODUCTION

Welded Bombs for Insects

Disease-carrying bugs are almost as nasty as Japs. Welding is indispensable to a dispenser for a new insecticide—a "bomb" to kill the pests that spread yellow fever and malaria.

Fig. 1—Sprayed out in a fine mist, the Army's insecticide is death to all forms of insect life but harmless to human beings.

TROPICAL diseases used to claim more soldiers' lives than enemy bullets—not in this war, however. American soldiers are protected against yellow fever, malaria and other tropical diseases by a liquid that is deadly to disease-carrying insects but harmless to humans. The dispenser for this product, aptly named a "bomb" by Westinghouse workers, is a joint development of the United States Department of Agriculture and Westinghouse.

Death-in-a-Mist

The insecticide fluid, far more effective than anything formerly available, was developed by a member of the U. S. Department of Agriculture. So penetrating that it seeks an insect in the tiniest crack or hole, it consists largely of an extract of Pyrethrum flowers. These were originally native to Japan, but the plant, fortunately, was transplanted to British East Africa, which is now our main source of supply. Oil of sesame, that East Indian herb of Arabian Nights fame, is the second active ingredient; the two agents, properly combined, are carried by a vehicle that can instantly be converted to a fine mist (an aerosol).

Thus at the outbreak of the war our Army Medical Corps had at hand the ammunition to wreck tremendous havoc in the ranks of our insect foes, but at first there was no satisfactory way to dispense it. Ordinary spray equipment was tried and found to be both bulky and heavy.

Refrigerator Man Remembers

A former refrigerator engineer at Westinghouse was presented with the problem. He happened to remember that years ago he had helped develop a device called a charging bomb for filling an electric refrigerator with cooling fluid. Working along these lines, he developed the needed bomb for stopping insects. You can see how handy it is from Fig. 1. Yet, basically, it consists of nothing more than a metal container about the size of a common tin can. It differs from a tin can, however, in its ability to withstand high internal pressure. The aerosol bomb (really a spray gun) is loaded with the insecticide mixture and a charge of Freon. When in use, the Freon vaporizes the mixture and forces it out in a pressure spray.

Capillary tubes are fastened to the container in order that the men using the bombs may be able to control the amount of fluid spread at any spraying. Steel tubing supplied by the Summerill Tubing Co. is cut into lengths to use as capillary tubes, as part of the process of manufacture at the East Springfield Works of Westinghouse. The tubing is cut in such a manner as to preserve the inside diameter, and the capillary is then fastened to the lower half of the container by means of a bracket, which supports the tube in its proper position inside the container. The supporting bracket is spot welded into place.

A Brazed Assembly

The upper half of the container is assembled with the nipple through which the tubing extends, and the parts are brazed into place. The cap will be ultimately fastened to the nipple. The container is given a leak test under air pressure, then filled with the insecticidal mixture (Fig. 2). After filling, the portion of the tubing extending beyond the outside of the can is welded closed to provide a positive seal. The cap, attached by waterproof tape, is used to permit intermittent use of the dispenser after the capillary tube has been broken.

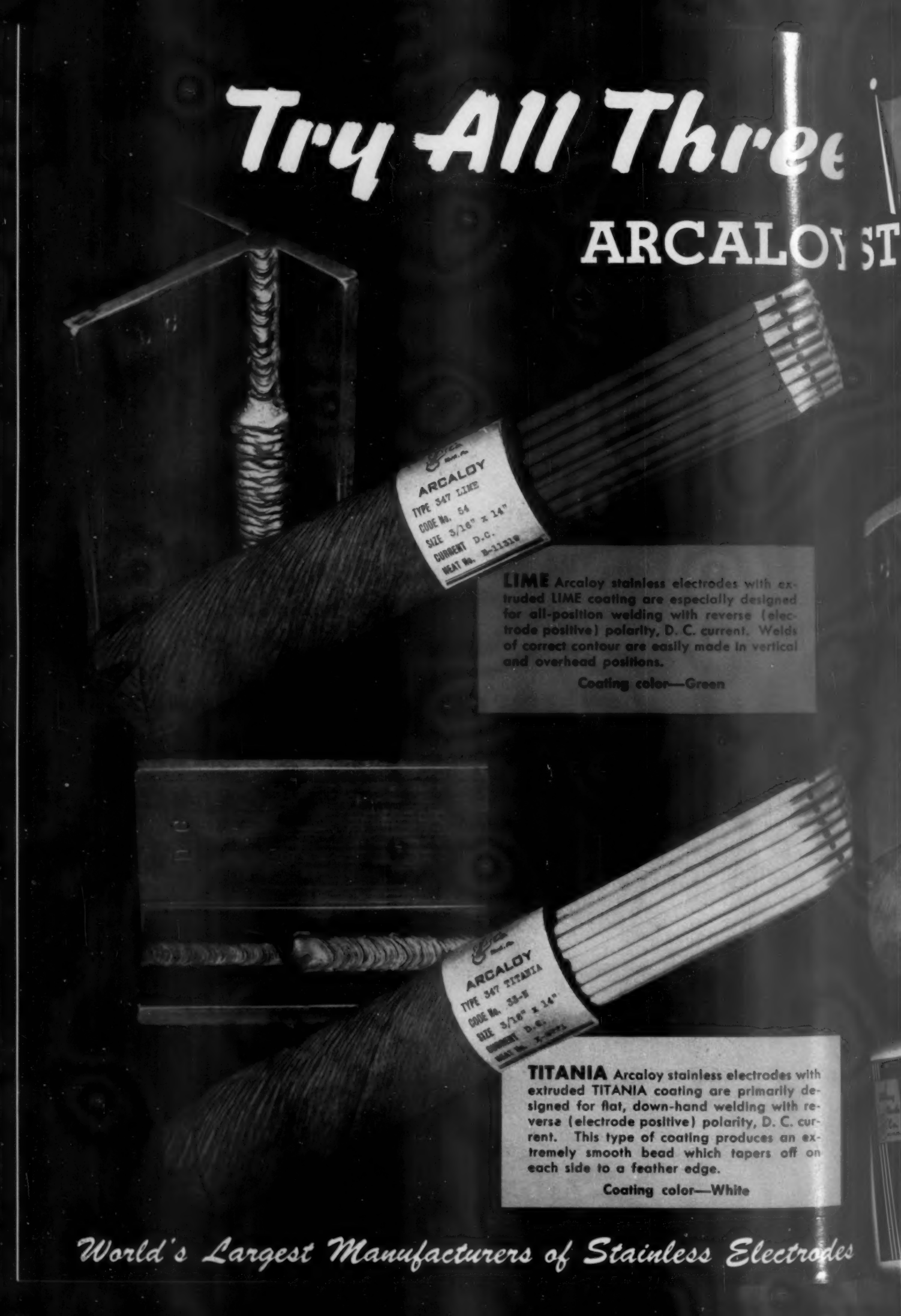
With this insecticide, planes can be disinfected in flight, hospitals can be fumigated without moving patients, foxholes can be protected for as long as 4 to 6 hours while men are lying in them. Each bomb contains enough insecticide to last about 14 minutes and to cover some 150,000 cu ft of space —equivalent to the cubic capacity of 240 Army pup tents or 50 giant bombers.

It doesn't seem strange that a new way of killing insects has proved to be one of the most important ways to save the lives of our fighting men.

Fig. 2—Filling the containers after they have been brazed and tested. The tubing which extends beyond the outside of the can will be welded closed to provide a positive seal.

Try All Three

ARCALOY ST



LIME Arcaloy stainless electrodes with extruded LIME coating are especially designed for all-position welding with reverse (electrode positive) polarity, D. C. current. Welds of correct contour are easily made in vertical and overhead positions.

Coating color—Green

TITANIA Arcaloy stainless electrodes with extruded TITANIA coating are primarily designed for flat, down-hand welding with reverse (electrode positive) polarity, D. C. current. This type of coating produces an extremely smooth bead which tapers off on each side to a feather edge.

Coating color—White

World's Largest Manufacturers of Stainless Electrodes

LIME

TITANIA

AC-DC

STAINLESS ELECTRODES

Only ALLOY RODS COMPANY CAN FURNISH ALL THREE

The Alloy Rods Company is the only manufacturer of stainless electrodes that can furnish all three types of coating. One of these Arcaloy electrodes will fit your shop needs. Try all three to determine the one best suited for your welding requirements.

Physical and corrosion resisting properties will meet all requirements. Arcaloy electrodes are shipped to you in five pound moisture proof packages, boxed in 50 lb. boxes for complete protection against both weather and handling. Get complete details from your local distributor or write Alloy Rods Co., York, Pa.

AC-DC Arcaloy stainless electrodes with extruded AC-DC coating are designed for all-position welding with either AC or DC current. These electrodes will produce smooth beads with low splatter loss and instant arc establishment on all types of AC transformers.

Coating color—Brown

Arcaloy Tool Steel Electrodes for repairing, rebuilding, and composite fabrication of tools and dies are now available—Write for catalog.

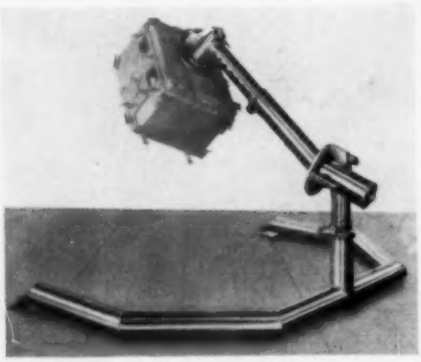
Alloy Rods Co.

YORK, PA.

New Products to Use

Work Positioner

★ A new balanced positioner offers "finger-tip" manipulation through 360 deg of rotation and 135 deg of tilt. The center of gravity stays in one position through all manipulations, and hence



Model No. 5 Bentley work positioner. Work weighing up to 500 lb can be rotated or tilted without a motor.

there is no need for power equipment, manufacturer stresses. A seated operator can perform assembly operations on a heavy item as easily as if holding a small part in one hand.

In this unique arrangement, the tilting spindle is located below the faceplate, permitting long structures to be mounted without interfering with the tilt axis structure. The work is located on the faceplate to balance about the rotation spindle, and the horizontal telescopic arm is adjusted to balance the work about a tilt axis. The portable pedestal supporting the tilt arm has a vertical adjustment so that the height of the work can be adjusted to suit clearance above the floor or the operator's convenience. The vertical leg of the tilt arm can be set in a pipe mounted in the shop floor or in brackets projecting from a wall column or bench. The pedestal feet are spread out in a 90 deg arc swinging about the vertical supporting pedestal.

Cam-operated pins engage index plates to lock the work in 15 deg intervals of both rotation and tilt. Index plates spaced to suit a specific operation can be substituted for the standard 15 deg spacing.

Model No. 5 (illustrated) has a capacity of 500 lb, with center of gravity from 6 to 12 in. above the faceplate. Model No. 1½ has a capacity of 150 lb. **Bentley Weldery, Inc.,** Dept. A, Box 1038, Syracuse, N. Y.

» «

Arc-Time Recorder

★ This arc-time recorder is a compact device for "metering" the performance of a welding machine and operator by totalizing the arc time in minutes. Essentially, it consists of a calibrated relay system which energizes a synchronous time recorder when the arc is on. No time is recorded when the arc is off or when the electrode is grounded to the work. The recorder totalizes arc time up to 99,999 minutes on a cyclometer-type dial, which is read at the end of a specific welding operation or work shift.

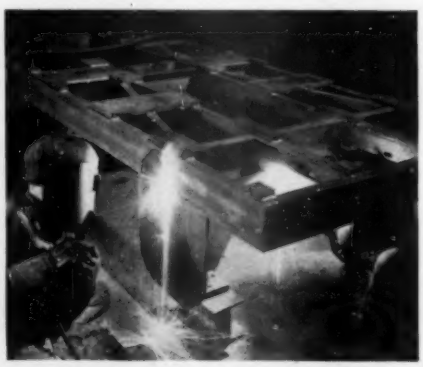
Recorder operates on the voltage principle and for its connections requires only small control wires which do not affect the main welding leads. The equipment is housed in a watertight case suitable for outdoor installation where this is desired. **Baier & Ackerman, Inc.,** 18 East 41st St., New York City 17.

Baier & Ackerman arc-time recorder for totalizing welding time.

» «

All-Position A-C Electrode

★ The use of a-c welding for vertical and overhead work has hitherto been somewhat hampered by the lack of an all-position a-c electrode capable of depositing ductile and non-porous weld metal. The difficulty is now rectified by the new ACP electrode which has just emerged from Westinghouse research laboratories. This electrode meets the requirements of the U. S. Navy Department Bureau of Ships as well as the standards for welding set by various associations. Its coating includes an "arc pacifier" element that prevents excessive spatter loss and an arc stabilizer element to aid in reestablishing the arc after each current zero. A high-organic electrode coating is used, which leaves but a scanty slag over the deposited metal.



A new Westinghouse all-position a-c electrode makes possible overhead and vertical welding.

Curiously, a high-organic coating works in a satisfactory manner when the current flows in one direction only. This restriction has impeded the progress of a-c welding for some 15 years. The secrets of the coating for all-position a-c welding did not begin to unfold until some two years ago, when it was found that the arc stabilizing and arc pacifying factors were of greatest importance in a-c welding.

The arc pacifier serves to prevent excessive spatter loss during the negative half cycles and to avoid loss of drive and penetration while the current is flowing in the direction opposite that in which high-organic coatings operate best. The arc stabilizer provides an enveloping atmosphere of highly ionized gas so that the arc will restrike for the succeeding half cycle immediately after it has been extinguished at current zero. **Westinghouse Electric Corp.,** East Pittsburgh, Pa.

» «

Armor-Clad Electrode Holder

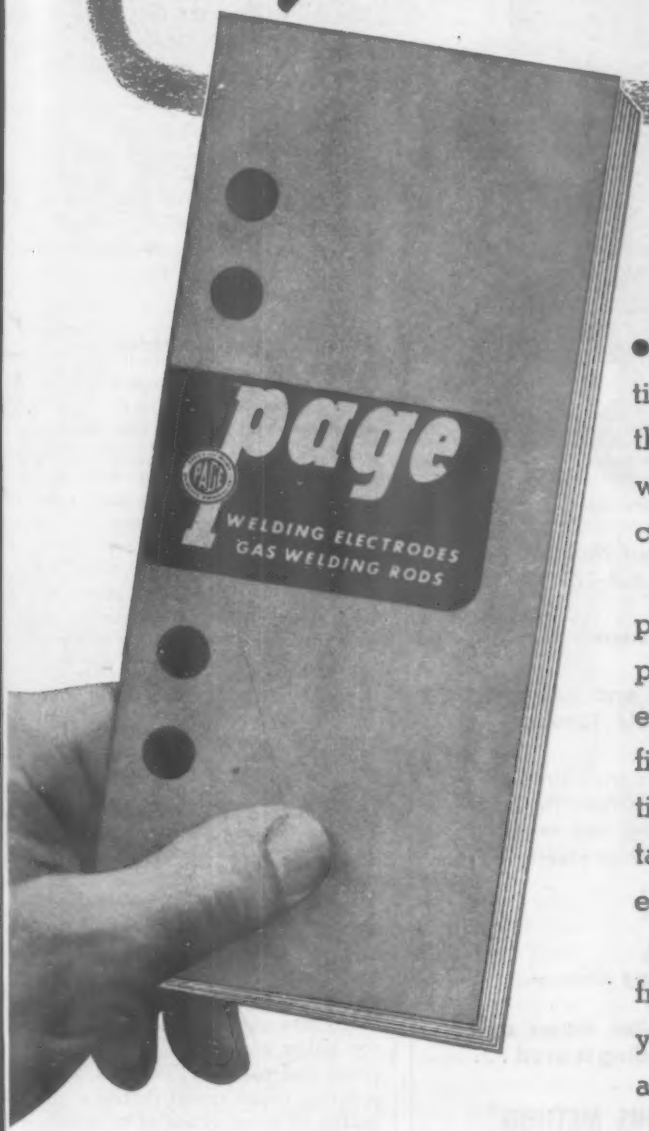
★ A screw-type, armor-clad electrode holder recently announced by the electric welding division of the General Electric Co., Schenectady 5, N. Y., is light in weight (15 oz) and designed to accommodate electrodes up to and including ¼ in. Its head is completely enclosed in a sheath of aluminum armor, which protects the insulation, resists weld spatter and eliminates the possibility of accidental contact with the welding circuit.

G-E armor-clad, fully insulated electrode holder. Insulation is protected from weld spatter.

A slight twist of the hand tightens or releases the electrode. Good current contact is maintained while in use, which keeps the holder cool. A soldered cable connection also helps the holder to remain cool. The width of the electrode slot limits the size of the electrode which can be inserted, thus avoiding the possibility of overloading the holder.

PAGE *Welding* ELECTRODES

IT WILL SOON BE *Dog-Eared* FROM USE



● This new **PAGE** book is so informative, so complete and so easy to use, that we prophesy in many shops it will soon become dog-eared from constant use.

Twenty-eight different classes of production welding are listed. Opposite each is the recommended electrode or gas rod. Complete specifications and welding characteristics of each electrode and rod are tabulated for quick reference and easy reading.

You can get copies of this book from your **PAGE** distributor. Or, if you prefer, write to the **PAGE** factory at Monessen, Pa. Ask for DH-821.

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Los Angeles, New York, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

ACCO TRADE MARK

THE "MISSING LINK"

"A chain is no stronger than its weakest link." That's self-evident. But what happens if an entire link is missing? Naturally, the chain doesn't function at all.

60 Kva. BH Type Induction Heater with automatic heat recording and controlling equipment

Preheating may be the one missing link in your chain of welding operation that causes you to miss out. Don't neglect this important link to good results.

Your welding job is no better than the heat treatment it receives, both before and after welding.

If you select Low Frequency Induction pre- and post-heating equipment, you assure dependable results and absolute control in this important link.

The Smith-Dolan System provides maximum convenience and efficiency in Induction Heating. It is now meeting successfully the long felt need for a combination shop and field heating unit to bring dependability to the welding of alloy and high carbon steels.

Whether the welding job involves:

High pressure steam lines . . .
or
The propeller shaft of a fighting ship . . .
or
Pre- and post-heating of boiler drums and plates when automatic arc welding is used . . .
. . . or any other important job . . .

THE RESULTS JUSTIFY THE SELECTION OF THIS METHOD

Wherever controlled deep heating penetration is necessary, the Smith-Dolan System is the choice.

Our experience is at your service. Let us show you how pre-heating and normalizing can make a better welding job for you.

ELECTRIC ARC INC.

152-162 Jelliff Ave. Newark 8, New Jersey

Also manufacturers of

Arc Welders—Gasoline and Diesel Driven—Power Units—A. C. Welders

Electrode Holder

★ A screw-type electrode holder a third lighter than clamp-type holders of corresponding size has been announced by the **Allis-Chalmers Mfg. Co.**, Milwaukee 1. Exposed metal surfaces are constructed of spatter-resistant Mallory metal. Simplified design facilitates replacement of parts; heavy insulation and adequate handle-ventilation provide cool operation. This holder has already proved its worth in Allis-Chalmers' own welding shops, the company's announcement states. It is now commercially available in light and heavy-duty sizes to accommodate electrodes up to ⅜ in. in diam.

Allis-Chalmers electrode holder. A lightweight holder of simplified design.

» «

Hard-Facing Electrodes

★ "A-C Nickel Manganese," "A-C Mo Mang Manganese," "X2" and "X3" are four new additions to the Allis-Chalmers electrode line. The two manganese electrodes are said to have wide application in the mining, cement and railroad industries for the repair and building up of worn equipment. Characteristics of the weld deposit allow it to work harden to 550 Brinell. These electrodes are available in assorted sizes, both bare and coated. The coating is a combination suitable for either a-c or d-c welders.

Hard-facing electrodes X2 and X3 are used to protect parts subject to extensive wear: X2 is used for severe abrasion and mild impact and X3 for severe impact and mild abrasion. These electrodes are available in assorted sizes with combination a-c/d-c coating only. **Allis-Chalmers Mfg. Co.**, Milwaukee 1.

» «

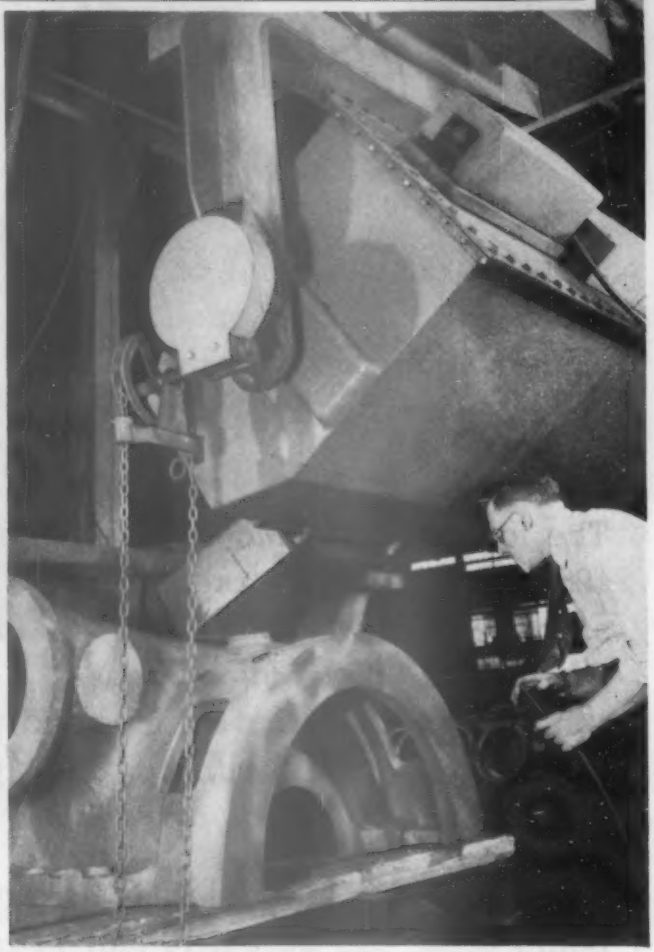
Bronze Electrode

★ "EutecTrode 28" is a bronze-alloy electrode shielded with a newly devised flux coating that makes it suitable for either a-c or d-c welding on bronze, brass and copper. The weld deposits are a dense, tough metal that is a good color match to most types of bronzes; welded areas have substantially the same corrosion resistance as the various base metals possess.

This electrode can also be used for joining bronze, copper and/or brass to cast iron and steel or for overlaying steel or cast iron to provide good bearing surfaces. It is available in ⅛ and $\frac{5}{32}$ in. diameters and can be identified by a light-green tip. **Eutectic Welding Alloys Co.**, 40 Worth St., New York City 13.

ALLIS-CHALMERS ELECTRODES HAVE GOT TO BE GOOD!

BECAUSE: 1) We use them *ourselves* — tons of them a day... 2) We constantly check weld metal by X-Ray, tensile machine, metallographic microscope, etc. — to be *sure* A-C electrodes are coming through right.



1 Builders of the greatest variety of capital goods in the world, Allis-Chalmers is also one of the world's largest *users* of welding equipment. Thus we ourselves use Allis-Chalmers electrodes for practically *every* type and size of welding job known to industry. In one A-C shop alone over one and a half tons of arc welding electrodes are used every day. That means Allis-Chalmers electrodes are being continually tested *in production*—under *all* welding conditions.

2 Soundness of weld is determined by modern research equipment such as the above giant 400,000 v X-Ray machine—being maneuvered into position to "shoot" part of a high pressure turbine. This positive, non-destructive method of weld examination provides a *direct* check on electrode performance. Yes, Allis-Chalmers electrodes have *got* to be good! You can get them at our nearby district office or welder dealer. Send for bulletin B6340. A 1808

ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A-C Electrodes
EASY TO REMEMBER
EASY TO BUY
Sold by AWS Number

HEADQUARTERS FOR WELDING EQUIPMENT

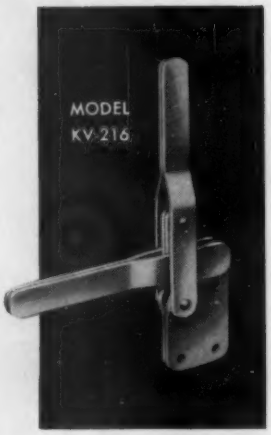
AMPAC A-C WELDERS

WELD-O-TRON D-C WELDERS

ARC WELDING ACCESSORIES

Do You Want Versatile Clamps?

APPLICATION OF MODEL KV-196



Here are two—typical of the score of clamps designed by Knu-Vise for increasing efficiency where holding is required.

The toggle bar of Model KV-196 (above) permits pressure spindle to be located anywhere along its length. When spindle is positioned at extreme end, pressure of 180 lbs. is obtained with only 30 lbs. pressure on handle.

The toggle bar of Model KV-216 (lower view), being solid, can be cut to suit your special needs. With a pressure of 70 lbs. on the handle a maximum pressure of 240 lbs. can be obtained ⅜" from end of toggle bar.

Send for illustrated catalog giving information on all types of toggle-action clamps available for your use.

BUY WAR BONDS

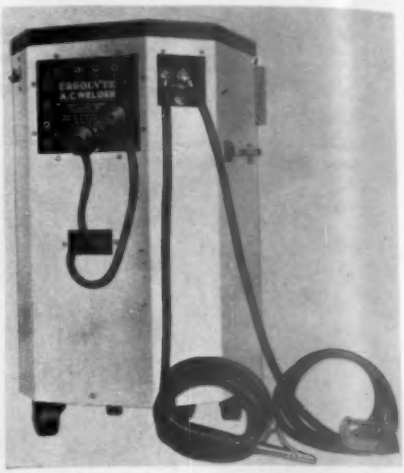
KNU-VISE
INCORPORATED

1336 Plum St., Detroit 16, Mich.
4328 San Fernando Rd.
Glendale, Cal.

A-C Welders

★ A new line of a-c welders in all-metal octagonal cases is announced by Ergolyte **Mfg. Co.**, 3627 North Lawrence St., Philadelphia 40. Each case is distinctively painted a bright red with a black top.

Ergolyte Standard 161 and Standard 251 have "plug in" knobs for selection



Ergolyte Models 161 and 251 a-c welders select amperage by plugging the proper hole.

of the desired amperage. Control panel and knobs are located on the front as shown in the accompanying picture. "Whirlwind" air-cooling assembly and/or "cyclone" automatic arcing assembly can be installed to meet specific welding needs, making four different machines possible. The standard machines plus fan and conversion accessories will provide a-c welders for continuous welding or machines that strike a quick arc with practically any type of rod.

A third new model is the heavy-duty 300 machine. This has a knob on the top to provide for stepless current adjustment, and heat changes are shown by a gauge on the front. This machine, manufacturer reports, has been tested with a variety of heavy production welding jobs such as generator bases and landing craft ramps.

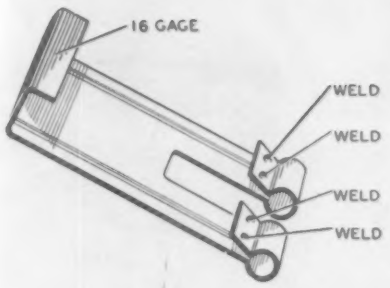
» «

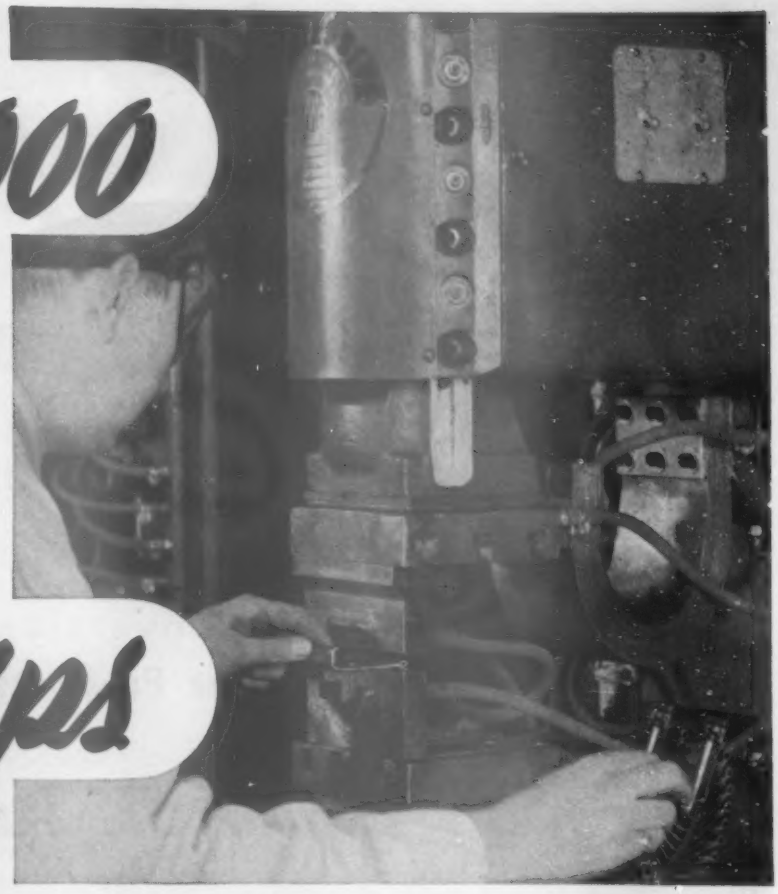
Bronze Rods

★ Certain bronze alloys that were previously available only as sand, permanent mold or centrifugal castings are now being produced by a continuous casting process in mill-length rods of high quality. As the name "continuous casting" implies, the rod is produced by the continuous withdrawal of metal from the bottom of a casting crucible. The metal is solidified as it leaves the crucible and passes through a suitably cooled die of closely held dimensions. It is then guided by driving rolls to a traveling cut-off device.

The structure of these continuous cast bronze rods is said to be extremely uniform. The lead content or other secondary constituents are dispersed in a finely divided state throughout the entire section, and the density of the material is for practical purposes equal to the theoretical density. **Ampco Metal, Inc.**, 1745 So. 38th St., Milwaukee 4.

Welds 2000 Steel hasps per hour





That's the job one PROGRESSIVE projection welder has been doing, hour after hour, day after day. The unusual output rate, without requiring automatic loading, is made possible by two things:

1. The positive and consistent operation of PROGRESSIVE equipment.
2. Designing the part and dies so that locating and clamping is unnecessary.

Four small projections are stamped into the metal near the hinge eyes in the forming operation. To secure the eyes, the hasp is merely laid on the lower die of the welder. The upper die comes down, current comes on automatically, and welds the eyes closed at the projections.

In projection welding, accurate locating with reference to electrodes is usually unnecessary. Frequently simple flat welding dies can be used. An air hose coupled to a solenoid valve blows the part off the die into a basket when the operation is completed and the machine head raises.

PROGRESSIVE field engineers, backed by a greatly expanded staff of design and application engineers selected from the resistance welding industry for their breadth of experience and "results", will be glad to help you simplify and speed up your assembly and welding operations.

ARE YOU RECEIVING PROGRESSIVE'S "WELDING PICTORIAL"?
Ask for it on your Company Letterhead.

PROGRESSIVE WELDER CO.

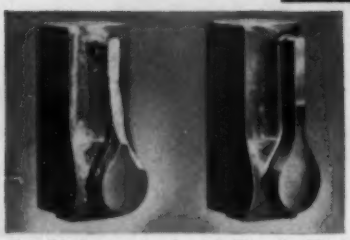
SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT 12, U. S. A.

Eureka TOOL STEEL ELECTRODES

SAVE vital tool steel for Victory

SAVE time in Reconversion to Postwar Products!



Die Unit repaired with Eureka Tool and Die Welding Electrodes. No heat treatment required.

Compositely Constructed Die Unit using Eureka Tool and Die Welding Electrodes. No heat treatment required.

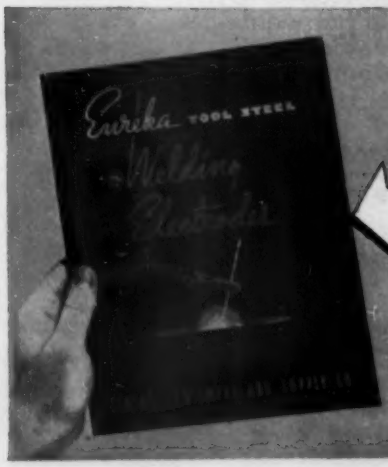
Here are just a few examples of how Eureka Tool and Die Welding Electrodes are saving vital tool steel and countless man hours. 1. For repairing existing units that fail in operation. 2. For creating cutting edges or working areas in the composite fabrication of units using mild, medium, high carbon or S.A.E. steels as a base. 3. For correcting design by facilitating changes in contours, corners or edges during die "try-out" or "change-over" programs. 4. For rectifying errors made in manufacturing units eliminating conventional inserts. Shown at left are samples of Die units that were repaired and constructed with Eureka Electrodes. For additional technical information write today for our illustrated catalog.

★ *If you are making postwar plans now, we invite you to write us for complete information on Eureka Electrodes today.* ★

EUREKA Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN



WRITE FOR YOUR COPY TODAY

This manual will help you save man-hours, conserve material and minimize production delays by outlining methods of repairing and compositely fabricating tools and dies, as well as correcting design and rectifying errors. Send for your copy today. It is fully illustrated with typical welding applications.

Larger Capacity Welder

★ To meet demands for larger capacity in a square frame welder, P&H engineers have developed the new Model WA-300, which provides a welding service range rating of from 60 to 375 amperes. This model retains the simple compact design of the smaller square frame welder and also such features as single heat control, visual current calibration and adaptability to parallel operation where higher amperage is desired. New features include: weatherproof construction, polarity reversing switch, removable stator, overload protection for contacts and for the low-voltage magnetic starter. **Harnischfeger Corp.**, welding division, 4400 W. National Ave., Milwaukee 14.

P&H Model WA-300 square frame welder.

» «

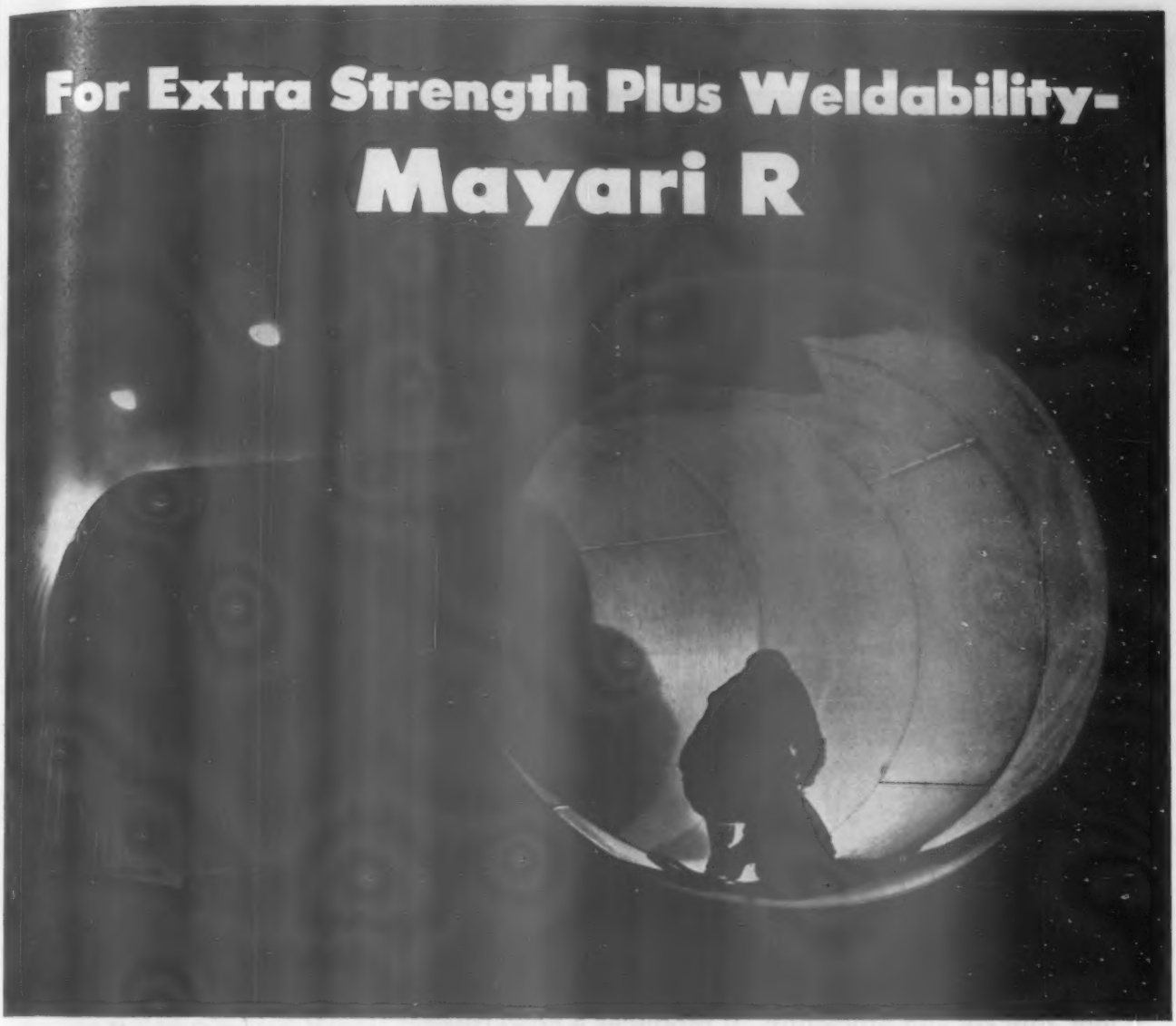
Heavy-Duty Lock Clamp

★ The "push-and-pull" lock-type toggle clamp introduced by De-Sta-Co several months ago to serve in locating and indexing operations is now supplemented by a larger model for heavier work involving the same production operations.

De-Sta-Co No. 610 toggle clamp. A new "push and pull" lock clamp for heavy-duty locating and indexing work.

The new clamp, Model 610, can be quickly converted from push to pull action or vice versa in a few seconds by simply relocating one of the handle bolts. It weighs 1½ lb, has an overall length of 6¾ in. in push position and a plunger rod travel of 1½ in. The plunger rod is tapped to receive a ⅜ in. threaded bolt that provides a quick adjustment to the work being handled. **Detroit Stamping Co.**, 372 Midland Ave., Detroit 3.

For Extra Strength Plus Weldability-
Mayari R



Mayari R,* Bethlehem's high-strength, low-alloy steel, has a unique place in the family of ferrous metals. It's a natural for jobs where extra strength, reduction in deadweight, resistance to abrasion and atmospheric corrosion are required. And with these advantages, Mayari R is readily workable under usual shop practices, and welds as readily as ordinary structural steel.

Mayari R can be welded by all the usual electric and gas methods, such as electric-resistance and the various fusion methods. Neither the weld nor the adjacent metal air-hardens appreciably. With electric-resistance processes, Mayari R can be spot-, seam- and flash-butt welded without difficulty—and shear tests on Mayari R welds show substantially higher results than shear tests carried out on comparable mild-steel welds.

For full information about Mayari R and its superior welding and other characteristics, send for illustrated descriptive booklet. Address Bethlehem Steel Company, Bethlehem, Pa.

Diagram showing Rockwell B hardness on welded plate of Mayari R.

*Rhymes with "fiery". The "R" is for "Rust Resisting." Mayari, in Cuba, was the source of the original natural alloy-bearing Mayari ore.

BETHLEHEM STEEL

Mayari R *makes it lighter... stronger... longer lasting*

RUEMELIN Fume Collector

PAT'D.

REMOVES WELDING FUMES
At the Source!

No longer need your employees inhale welding fumes. A Ruemelin Fume Collector solves the problem, quickly and efficiently. It produces a powerful suction that draws out noxious gases, smoke and heat *at the source*. Guards employee health, resulting in less welder fatigue, therefore greater plant output. Has many exclusive features: (1) Clears shop air with minimum loss of building heat. (2) Exhaust snout can be positioned instantly and conveniently. (3) Covers maximum welding territory, vertically, horizontally and by circle swing. (4) Shipped completely assembled, easy to install. Thousands of Ruemelin Fume Collectors now serving war industries everywhere. 9 ft. and 15 ft. sizes available.

We gladly offer engineering service for your fume collector installation. Write for Bulletin 37-C.

RUEMELIN MFG. CO.

3894 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

MANUFACTURERS AND ENGINEERS

SAND BLAST AND DUST COLLECTING EQUIPMENT, WELDING FUME COLLECTORS

A 4709-⅞

Magnaflux Inspection Unit

★ Of radically different electric design is the KH-2, a new portable unit for magnetic-particle inspection. It furnishes half-wave, single-phase rectified output

Magnaflux KH-2—a portable unit to provide a source of suitable current for magnetic-particle inspection in welding shops and foundries. Powder blower is shown at the left.

for a-c magnetization and also high-amperage, low-voltage a-c for both magnetization and demagnetization. The powder blower (see illustration) is the only auxiliary equipment required.

Chief advantages of this inspection unit are said to be: (1) It permits detection of deeper subsurface discontinuities and enables its operator to distinguish between laminations and segregations in rolled plate. (2) Welds designed with open roots can be inspected without the interference of non-relevant indications. (3) Unit may be used to locate thermal cracks, lack of penetration and fusion, slag inclusions and other discontinuities in welds. (4) It locates shrinkage cracks, blowholes, porosity, etc. in castings, fatigue cracks in machinery parts or various defects in forgings.

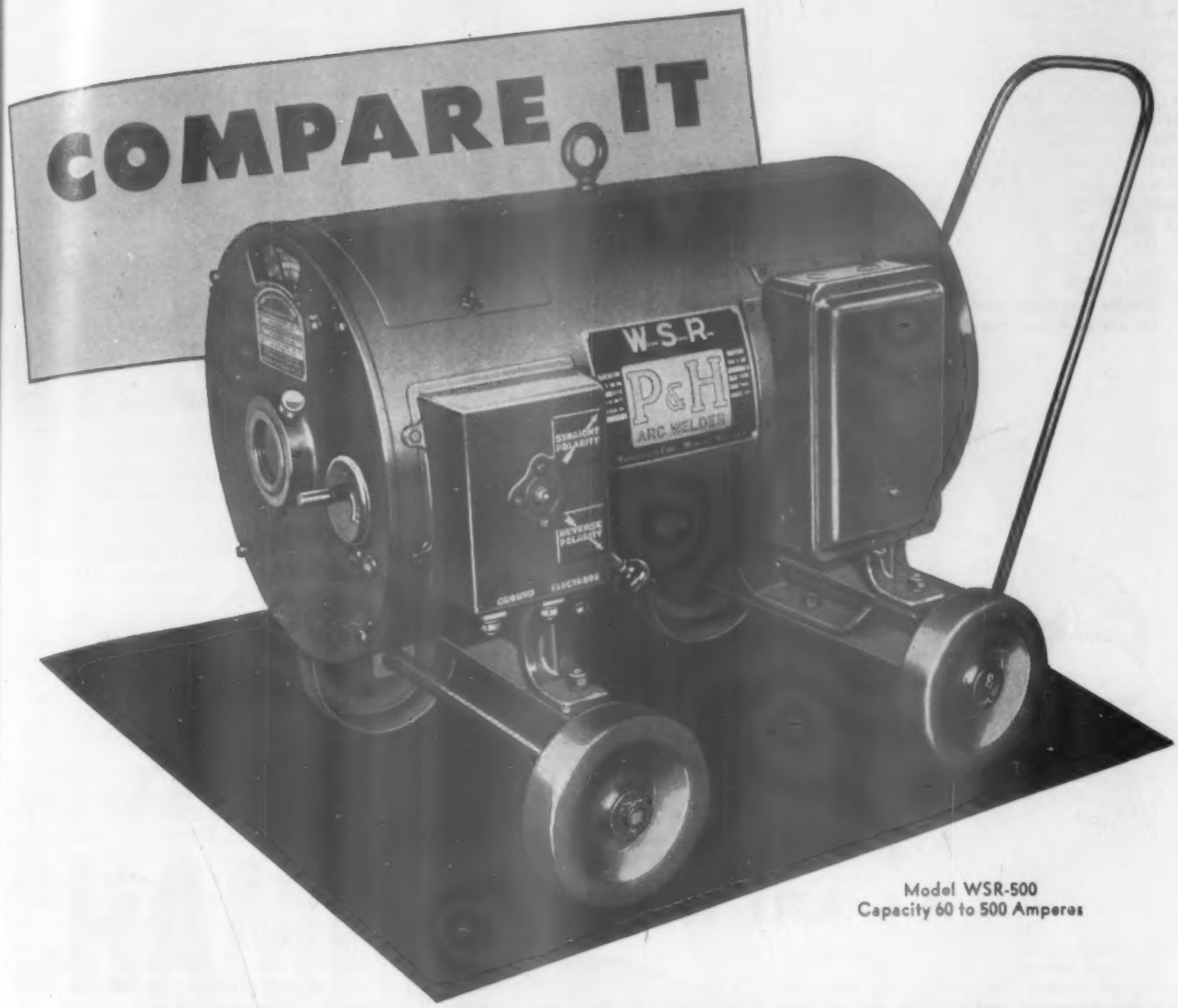
This unit is recommended for general use in welding shops, foundries, oil refineries, shipyards, etc. **Magnaflux Corp.**, 5900 Northwest Highway, Chicago 31.

» «

Electric Shear

★ Stanley No. 214 "Unishear" is a lightweight portable electric shear that will cut 14 gauge hot-rolled steel and other sheet materials in proportion. Little effort is required to cut straight lines, curves, angles and notches accurately and without distortion of material, states manufacturer. Blades can be removed for sharpening and replaced quickly. **Stanley Electric Tools**, Division of The Stanley Works, New Britain, Conn.

Stanley Unishear No. 214. It cuts up to 14 gauge steel sheets.



Model WSR-500
Capacity 60 to 500 Amperes

. . . FOR DOWNRIGHT VALUE!

No matter how you look at this P&H WSR-500 Welder—it spells *value!* Value from its more liberal use of copper . . . its ample capacity . . . its ability to handle larger electrodes to cut the cost of depositing weld metal.

- SINGLE HEAT CONTROL — one simple adjustment for any desired welding current. The operator can't be confused. Arc response is automatic on all types of work — with all classes of electrodes.
- SIMPLIFIED DESIGN—only *two* major parts, a rigid one-piece frame and husky rotating member.
- WSR (WELDING SERVICE RANGE) RATING—certifying the exact usable welding current of each machine from minimum to maximum capacity. You know your cost per ampere.
- VISI-MATIC CALIBRATION—enables you to select instantly the correct current for each of the three classes of electrodes.

Write *today* for information on the Model WSR-500. P&H also manufactures a complete line of welding electrodes for all production and maintenance welding.

General Offices: 4513 W. National Ave., Milwaukee 14, Wis.

A COMPLETE ARC WELDING SERVICE

DC Welders · AC Welders · Welding Electrodes · Welding Positioners · Welding Control Systems · Electric Hoists

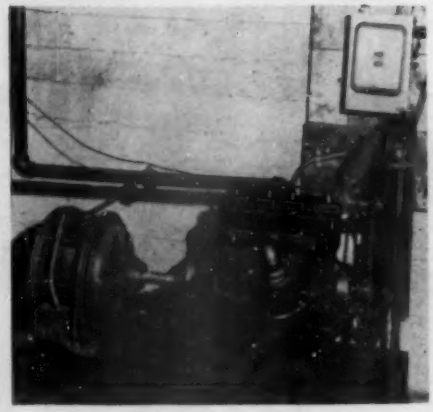
P&H ARC WELDERS

HARNISCHFEGER CORPORATION

WELDING ELECTRODES · MOTORS · HOISTS · P&H · ELECTRIC CRANES · ARC WELDERS · EXCAVATORS

Air Compressor Head

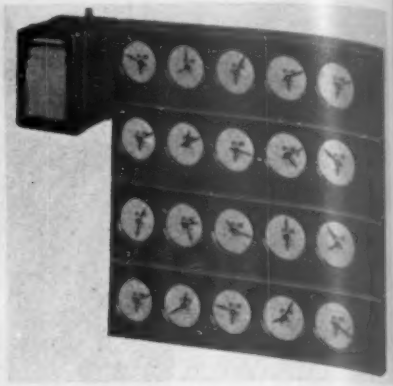
★ A new "Mogul" air compressor head which will put scrap engine blocks to work is designed for use on a Model A or B Ford motor block. It will deliver a volume of 139 cfm of air, with an actual delivery of 100 cfm at 100 psi. The complete unit includes valve and water chambers, air intake manifold, air strainer, unloader, pilot valve and necessary parts for assembly. **Metallizing Co. of America,** 1330 W. Congress St., Chicago 7.



"Mogul" air compressor head. It is designed for use on a Ford Model A or B motor block.

Arc Timer

★ A patent has been granted to Erwin C. Brekelbaum and Sol Oestreicher covering the basic functions of an arc timer



P&H arc timer. It records the actual time spent by each operator in depositing weld metal.

for use in conjunction with the P&H production welding control system. The timer is an electric clocking device which is connected to the circuit of a welding machine and records the actual time spent by the operator in the deposition of weld metal. **Harnischfeger Corp.,** 4400 W. National Ave., Milwaukee 14.

» «

Cylinder Truck

★ For the oxy-acetylene weldor who must take his equipment to the place of welding, **Palmer-Shile Co.,** 7107 West Jefferson Ave., Detroit 17, has provided a new all-metal all-welded truck designed to carry one oxygen and one acetylene cylinder. The cylinders rest in specially designed cradles that hold them stable during transport. The truck handles are equipped with a cross bar and welded hooks to support the welding torch and gas hose. A tool box is mounted on swivels so that the tools will always be in a level position. The truck framework is of angle iron and sheet metal; the handles of heavy tubular steel. Overall height is 48 in., width 29 in., wheels 24 by 2 in.

Palmer-Shile cylinder truck. Lower left sketch shows how equipment is carried.

*Knotty Problems**

**THE ANSWER IS...*

MARQUETTE
REGISTERED U.S. PAT. OFFICE
A.C. ARC WELDERS

The Granny-knot belongs in the class of old fashioned methods of drilling, tapping, screwing and riveting. The old methods were inefficient, slow and costly. When the job was finished it was no stronger than the weakest bolt or rivet.

Modern Welding is the answer to the problem of Lower Costs and Faster Production. Welding joins the parent metals into a solid piece for quick, dependable fabrication which gives greater strength, with reduced weight.

PRODUCTION or MAINTENANCE

Marquette A. C. Arc Welders are versatile. High-Speed Production on all types of work or making quick, dependable repairs on broken machinery, all jobs are taken in stride with this welder.

LOW INITIAL COST — LOW COST OPERATION
NEGLIGIBLE UPKEEP — NO "MAGNETIC BLOW"
10 Models, 125 to 400 Amps.
Completely Equipped

BUY THE BEST —
BUY MARQUETTE

MARQUETTE
REGISTERED U.S. PAT. OFFICE

MARQUETTE MFG. CO., Inc.
Minneapolis 14, Minnesota

WELDING *Equipment*
ELECTRODES AND SUPPLIES

...is always a

CHAMPION ELECTRODE

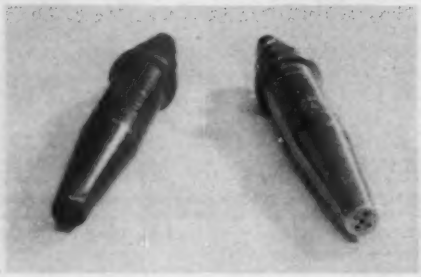
WHEN the going gets tough you can rely on a champion to come through with flying colors. That is why *CHAMPION* Welding Electrodes are the choice of welders who know what they will do in a tough spot. Extensive metallurgical research has gone into perfecting a line of electrodes which will produce exceptionally strong welds at lowest possible cost. The result is a winner—a true champion both in name and performance.

THE CHAMPION RIVET CO.
11400 HARVARD AVE. • CLEVELAND, OHIO
EAST CHICAGO, IND.

Tip Cleansers

★ When torch tips and fittings choke up with carbon, dimensional changes result, reducing the efficiency of the equipment. Manual cleaning methods consume time, rarely restore the equipment to its exact original condition. To facilitate tip renovation, a two-stage chemical procedure has been developed by **Turco Products, Inc.**, 6135 South Central Ave., Los Angeles.

The tips and fittings are first soaked in Turco L-780, a liquid which softens and loosens carbon and gum deposits. An overnight soak is usually sufficient to loosen all carbon and dirt so that it can be rinsed away with an air and water spray. The solvent is non-corrosive to copper and brass, non-inflammable, mixes readily with water and may be used at room temperature in an ordinary steel tank or container. After the parts have been soaked and rinsed, a brief dip in a second solution, Turco brass dip, is used to remove the oxide film from the outer surfaces. This leaves the metal looking clean and bright.



The torch tip at left seems hopelessly carbonized and fouled. On the right, however, we see it as it will look after treatment.

» «

Portable Insulation Tester

★ A small portable insulation tester capable of supplying smooth variable test voltages from 0 to 2,500 volts, can be carried in one hand and plugged into any 115 volt, 60 cycle outlet. The set has a capacity of 750 volt amperes and will stand one-minute loads of 1,500 volt-amperes without injury. It can be used to test electric apparatus ranging from the wiring for small appliances to Diesel-electric locomotives up to 600 hp. The voltmeter is supplied from a separate coil on the transformer winding and is arranged to give full-scale readings at either 2,500 or 1,250 volts.

G-E portable insulation testing set. It can be carried in one hand.

» «

Steel Desk

★ A portable steel desk suitable for shop foremen, shipping clerks, inspectors, dispatchers and others is being marketed by **Lyon Metal Products, Inc.**, 215 Clark St., Aurora, Ill. It stands on 3 in. swivel castors and measures 34½ in. wide, 30 in. deep and 53 in. high (43 in. high in front).

Lyon model No. 2131-15 portable steel desk.

Now! Shop Measurements to *One Millionth of an Inch* With Simple Light Wave Setup!

The wave length of light is the basis for this amazing new optical measuring equipment—which measures millionths of an inch as easily as a micrometer measures tenths! All that is required, in addition to a simple setup, is average eyesight, intelligence and arithmetic.

As shown above, the work was placed under the Monochromatic Light, upon the work and gauge block—and covered by the optical flat. The light, reflected back to the operator, by the top and bottom surfaces of the optical flat, creates interference bands, representing height intervals of 11.6 millionths of an inch. So that from the center of one dark band to the center of the next, the level of the work has risen or fallen 11.6 millionths of an inch. The bands, simply, are a contour map of the surface. This fact, in a simple mathematical formula, is sufficient to explain all the shop uses of optical flats, and give the work measurement, quickly and accurately.

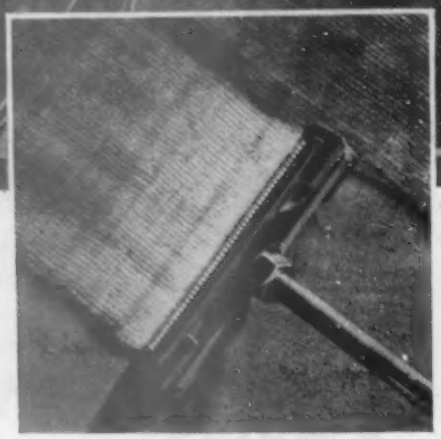
No longer, however, can your dealer give you Wrigley's Spearmint Gum. Today, under present conditions, this product cannot be manufactured up to Wrigley's quality standards. To protect consumer and dealer alike, the makers of Wrigley's Spearmint have decided to keep the quality Wrigley's Spearmint wrapper empty. Remember this wrapper, it means chewing gum of finest quality and flavor.

The Monochromatic Light.

Optical Flat. Surface of Work. Interpretation of bands on truly flat surfaces.

You can get complete information from Acme Scientific Division of Acme Industrial Co., 200 No. Laflin St., Chicago 7, Ill.

Z-70



FLAME-PRIMING

Saves Time! Saves Paint!

Oxy-acetylene flame-priming of steel, to remove loose scale, rust, and moisture before painting, requires less time than former methods. When the oxy-acetylene flame sweeps over the steel, the intense heat causes scale to expand and pop loose, and thoroughly dries the surface. Loosened foreign material can then be swept free with a wire brush. The surface is then clean, dry, and warm—ready for painting even in cold, humid, or fouled atmospheres. Because flame-primed surfaces can be painted satisfactorily under these conditions, it is possible to schedule painting at night and under weather conditions ordinarily considered unfavorable. Paint applied to warm surfaces dries quickly, thus decreasing its permeability to moisture.

Since the steel is still warm from the oxy-acetylene flame when the paint is applied, the fluidity of the paint increases so that a better bond is obtained, and less paint is needed than for application on a cold surface. In addition, heat prolongs the life of the paint by giving it a low-temperature bake on the dehydrated surface.

The flame-priming process is easy to learn and easy to use, and requires only a small amount of equipment. For more complete information about flame-priming, get in touch with your nearest Linde representative. If you prefer, write for the booklet, "Flame-Priming," Form 5322A.

MARITIME "M" AWARD FOR OUTSTANDING PRODUCTION ACHIEVEMENT

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities

In Canada: Dominion Oxygen Company, Limited, Toronto

LINDE OXYGEN . . . PREST-O-LITE ACETYLENE . . . UNION CARBIDE
OXWELD, PUROX, PREST-O-WELD, UNIONMELT APPARATUS
OXWELD AND UNIONMELT SUPPLIES

The words "Linde," "Oxweld," "Prest-O-Lite," "Prest-O-Weld," "Purox," "Union," and "Unionmelt" are trade-marks of Union Carbide and Carbon Corporation or its Units.

Helpful Literature Just Published

The following reviews are of recent publications of interest to those in the welding industry. Unless otherwise stated, they may be obtained without cost by writing to the manufacturers listed.

Thermit-Welding Booklet

A 36-page, letterhead-size booklet, handsomely illustrated and printed in several colors, traces the history of the thermit-welding process from discovery of the thermit reaction in 1895 to the present time. This book, "Thermit Welding for Fabrication and Repair," provides a detailed explanation of the process and includes a series of four-color charts which illustrate in cross-section the forming of a thermit weld. Other information relates to the application of the thermit process for general fabrication, repairs to heavy equipment (crankshafts, axles, cylinders and housings); thermit welding in steel mills; welding rails for steam and street railways, coal mine track and crane runways; marine work including the fabrication of stern frames and the repair of heavy parts.

Two pages of tables give thermit weld dimensions and portions required for both rectangular and round sections. There is also a table of sizes, dimensions and capacities of various crucibles and auxiliary equipment. In addition, the book contains a description of various members of the Murex line of arc-welding electrodes. **Metal and Thermit Corp.**, 120 Broadway, New York City 5.

» «

Maintenance Ideas

"101 Welding Ideas for Low-Cost Maintenance" (revised edition) is a 20-page, letterhead-size booklet showing how users of machinery and metal products can use arc welding to add new metal to worn parts, to repair or replace broken parts, or to build special production equipment, shop fixtures and structures of many kinds. The 101 ideas range from hard-facing a shaper tool to building a complete locomotive. Each is illustrated by a photograph of the particular job. **The Lincoln Electric Co.**, 12818 Coit Road, Cleveland 1.

» «

Ampco Bronze Bulletin

Ampco Bulletin 59 is a 12-page, letterhead-size booklet describing "Ampcoloy" alloys, a series of bronzes of controlled analysis including aluminum bronze, high-lead bronze, tin bronze, manganese bronze, beryllium copper and high-conductivity alloys. The new bulletin contains photomicrographs, physical properties and chemical compositions of the various members in the Ampcoloy series. **Ampco Metal, Inc.**, 1745 S. Thirty-Eighth St., Milwaukee 4.

» «

Hard-Facing Folder

"Resisto-Loy Hard-facings" is the title of a four-page, letterhead-size folder describing the Resisto-Loy line of hard-facing rods and electrodes and filler rods for use in the "Two-Tone" welding process. Helpful suggestions are given on electrode motions, electrode position, bead sequence, machine settings, etc., as well as procedures for "Two-Tone" welding. **Resisto-Loy Co.**, 127 Baylis St., S. W., Grand Rapids 7, Mich.

» «

Automatic Arc Welding

A 28-page, letterhead-size booklet has been published to describe the new "Lincolnweld" process for automatic shielded-arc welding. Essentially, this is a d-c metal-arc process in which bare electrode wire is power fed into a blanket of granular flux deposited over the joint to be welded. The rate of feed is controlled automatically for proper arc length. The booklet describes the process in details, cites its several advantages and gives suggested procedures for various types of butt, fillet and lap welds. **The Lincoln Electric Co.**, 12818 Coit Road, Cleveland 1.

Switch to Brazing with "BRIDGEPORT" BRONZE For Quick Repairs!

Bridgeport's Bronze Welding Rods are used to repair large castings as well as the copper coils shown above.

The free flowing and excellent tinning qualities of Bridgeport's Bronze Welding Rods make them ideal for producing exceptionally strong, corrosion-resistant welds on heater coils and other copper equipment.

Bronze welding is used advantageously to fabricate or repair, large and small parts or assemblies made of metals, which have a higher melting point than 1600° F.—including steel, cast iron, malleable iron, wrought iron, galvanized iron, monel, nickel and brasses with a high copper content.

"BRONZE WELDING ALLOYS" gives detailed information and practical suggestions on the selection and use of Bronze Welding Alloys, and tells why you should Switch to Brazing with Bridgeport's Bronze on your next production or repair job. Write for your copy today.

"Bridgeport" BRASS CO. BRIDGEPORT BRASS COMPANY BRIDGEPORT 2, CONN. • Established 1865

Bronze Welding Rod A PRODUCT OF BRIDGEPORT BRASS

THE Hard-Facing ANALYZER

THIS MONTH'S WEAR PROBLEM:

HIGH PRESSURE, HIGH-TEMPERATURE VALVES

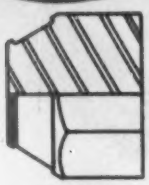
Selecting the proper hard-facing alloy for any job must always be based upon operating conditions which vary infinitely between applications. High-Temperature, High Pressure Valves, for example, must withstand combinations of:

- **HEAT up to 1000°F.**
- **PRESSURE of several hundred pounds.**
- **CORROSION from hot acids.**
- **ABRASION from moving fluids and particles.**

HIGH-PRESSURE, High-Temperature Valves lead a tough life because of multiple destructive factors. Corrosion eats away smooth finishes so that mating surfaces no longer seal against flow and corrosion is aggravated by heat. High pressures move pipeline contents at express-train velocity, etching channels wherever metal shows weakness or wherever imperfections exist.

STOODY 6 stops valve troubles because its characteristics are tailored to combat deficiencies of ordinary valve steels. STOODY 6 retains its hardness and wear resistance even at red heat; being non-ferrous it won't corrode . . . acid-bearing fluids and gases have little or no effect. Abrasion resistance is so high, valve life is often increased 10 times or more!

Furthermore, STOODY 6 is easily applied—forms deposits so dense and free from porosity that erosion can't get a start. Galling problems are likewise eliminated. And STOODY 6 is readily machinable with sintered carbides, simplifying finishing operations.

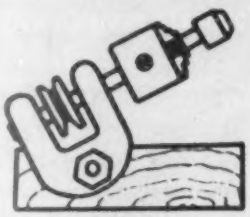


New Valve Application Procedure

APPLICATION

(1) Groove new valve surfaces 1/32" deep before applying STOODY 6. On old valves extra thick deposits (two passes) are applied without preliminary grooving. (2) When hard-facing, adjust valve in jig so that top surface receiving deposit lies horizontally. (3) During application, float all oxides to surface to obtain freedom from porosity. (4) Machine to size with carbide tipped tools. Surface grind faces for final finish.

Worn Valve Application Procedure



Adjust Valve Face Horizontally

A trial order of 3/16" diameter STOODY 6 at $4.25 per lb. will prove the merits of this alloy for all applications involving heat, corrosion, abrasion and impact. Folders on request.

STOODY COMPANY

1141 WEST SLAUSON AVE., WHITTIER, CALIFORNIA

STOODY HARD-FACING ALLOYS

Retard Wear Save Repair

"EITHEREND" CABLE CONNECTOR

Illustration shows connector apart with sleeves

BOTH ENDS EXACTLY ALIKE
Neither male nor female

Center illustration shows connector protected by the insulating sleeves pushed together and locked, ready for work: butt rubber sleeves make waterproof joint.

Lower illustration shows solderless type of connector without rubber sleeves.
Made in sizes from 4/0 to #10 soldered and from 4/0 to #6 solderless.

Send for Bulletin 49A

Albert & J. M. Anderson Mfg. Co.

289-305 A St. • **Boston, Mass.**
NEW YORK CHICAGO PHILADELPHIA LONDON

Off the Floor Deliveries!
ON
TRINDL *SUPER INDUSTRIAL* ***ARC WELDER***
DESIGNED FOR HIGH SPEED PRODUCTION ARC WELDING

TRINDL SUPER INDUSTRIAL ARC WELDERS, the result of many years of careful engineering and "job tested" research, are rolling up impressive production records. Acclaimed for superior performance, ruggedness, dependability, and economical operation.

For better, faster welding, easy-to-operate TRINDL SUPER INDUSTRIAL ARC WELDERS will help step up your production schedules 20% to 40%. Manufactured in a range of distinctive sizes to accommodate every type of shop and production welding job.

Trindl Welders, Electrodes, supplies and accessories, available for immediate delivery, will save you both time and money. Write, wire or phone for full details.

TRINDL PRODUCTS, LTD. 11 EAST 23rd STREET AR CHICAGO 16, ILL.

Manganese Steel Bulletin

The non-magnetic property of austenitic manganese steel, though important in many applications, has been given less recognition by far than the impact and abrasion resistance of this alloy. A new 32-page illustrated bulletin, "Non-Magnetic Applications for Amsco Manganese Steel," presents studies of typical applications where non-magnetism and the ability to withstand shock and wear were equally vital factors. These applications include lifting-magnet cover plates, collector shoes, fingers for stator cores, magnetic separator drums and rollers, electric furnace parts, aircraft instrument testing devices and a number of railroad applications. Ask for Bulletin 1144-NM. **American Manganese Steel Division** of American Brake Shoe Co., Chicago Heights, Ill.

» «

Flash-Welding Bulletin

"Flash-Welding—A Solution to Assembly of Forged Parts" is the title of a four-page, letterhead-size folder in two colors. Produced by **The American Welding and Mfg. Co.**, Warren, O., this publication gives a convincing description of the advantages of flash welding as a saver of machine time, stock, weight and handling time. Methods by which welded assemblies cut production costs are also mentioned. The text is liberally interspersed with data and pictures.

» «

Agricultural Award Rules

Rules and conditions for the $37,500 Agricultural Award and Scholarship Program recently announced by The James F. Lincoln Arc Welding Foundation are contained in a newly published 24-page, letterhead-size brochure. This publication explains all phases of the program, which is designed to encourage more intensive study of farm maintenance with a view toward the use of arc welding in repairing and building up broken and worn equipment and tools. The booklet will be sent gratis to those interested in participating in the program. Write: Secretary, **The James F. Lincoln Arc Welding Foundation**, Cleveland 1.

» «

"Jobs for the War Disabled"

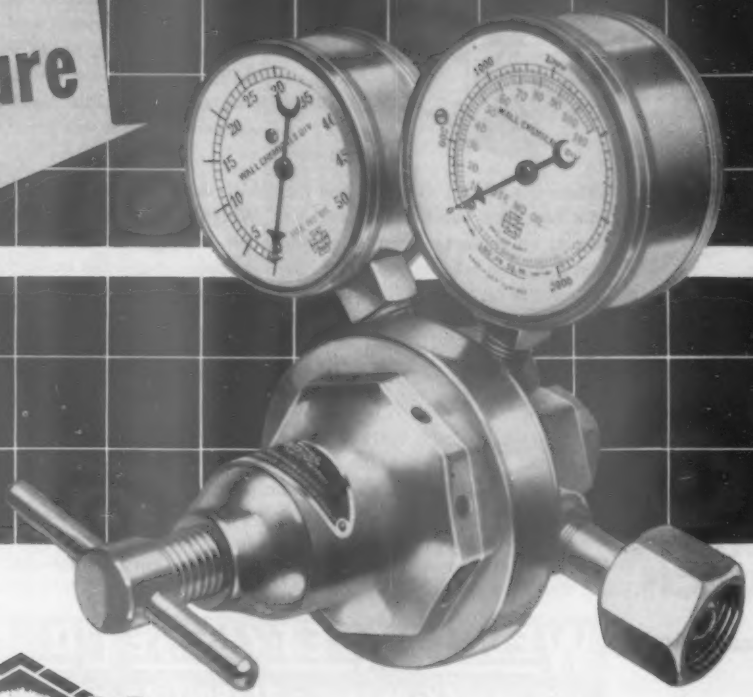
The above is the title of a folder prepared and distributed to remind employers of their responsibilities in treating the disabled veteran with consideration and finding work that he is equipped to do. A copy may be obtained free of charge from **The American Veterans Association**, 271 Madison Ave., New York City 16.

» «

Tungsten Booklet

The origin, properties, manufacture and uses of tungsten are described in an illustrated booklet available at 45c per copy from **Cleveland Tungsten, Inc.**, 10200 Meech Ave., Cleveland.

CONSTANT
EVEN
Gas Pressure



With Gasweld Pressure Regulators

Dependable and accurate—that is the story of "Gasweld" Pressure Regulators which assure *an ample supply of gas at a constant, even pressure.* The man on the job appreciates the simple construction—plus long-life, trouble-free operation and ease of repair that are characteristics of all "Gasweld" equipment.

A new-type "soft-floating seat" works WITH—not against—the pressure . . . It handles large or small gas pressure without excessive gauge drop. "Gasweld" Pressure Regulators are precision built, extremely sensitive, capable of fine adjustment and maintain accurately any desired pressure.

Available models include those for heaviest cutting or light welding . . . made for use with Oxygen, Acetylene, Hydrogen—or Propane and other petroleum fuel gases.

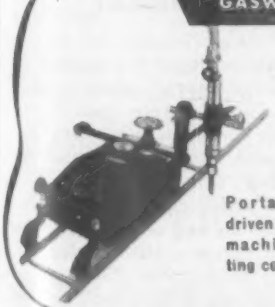
Write for illustrated bulletin and prices.

Weld Chemicals Division of

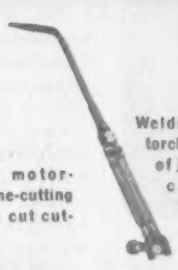
THE Liquid CARBONIC CORPORATION • 3110 South Kedzie Avenue, Chicago 23, Illinois

BUFFALO, N. Y. • CINCINNATI, O. • CHICAGO, ILL. • DETROIT, MICH.
LOUISVILLE, KY. • MILWAUKEE, WIS. • ROCHESTER, N. Y. • TOLEDO, OHIO
CANADA: MONTREAL, QUEBEC • TORONTO, ONTARIO • WINDSOR, ONTARIO

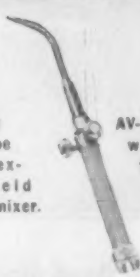
GASWELD OFFERS A FULL LINE OF WELDING AND CUTTING EQUIPMENT AND SUPPLIES



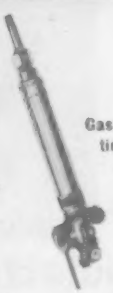
Portable motor-driven flame-cutting machines cut cutting costs.



Welding and cutting torches for every type of job. With the exclusive Gasweld "Free-Flow" mixer.



AV-10—Special lightweight AIRCRAFT torch for welding aluminum and light-gauge metals.



Gasweld Machine Cutting Torches are available for use with any flame cutting machine.

Safe Welding

AT LOWER PRODUCTION COSTS

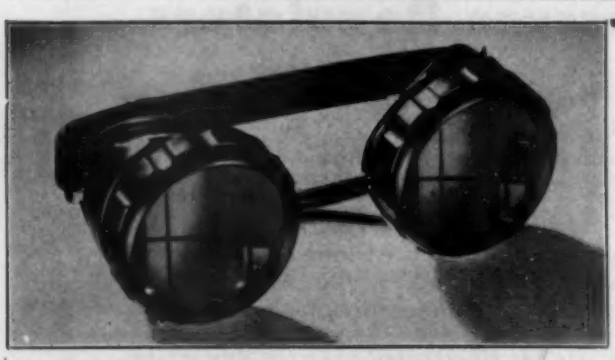
The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as *fifty* per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . *No readjusting required.* . . . Price $10.00 at Detroit. Order today.

Better Soldering, Annealing and Heating Jobs

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

WELDIT ACETYLENE CO.
628 BAGLEY AVENUE · DETROIT 26, MICH.



METRO'S
NEW
WELDING and
CUTTING
GOGGLE

Presenting the Second of METRO'S SAFETY "6" Series

METRO'S
WELDING and
CUTTING
COVERALLS

Metro Manufacturing Co. Long Island City 1, N. Y.

Hard-Facing Data Sheets

A comprehensive series of procedure sheets to explain the best methods of applying hard-facing alloys to various parts of equipment and tools is being compiled by **Mir-O-Col Alloy Co.**, 2416 East 53rd St., Los Angeles 11. Each is a two-page, letterhead-size sheet devoted to a single basic product. Four sheets have been published so far, covering the hard-facing of: (1) grader blades, (2) plow shares, (3) wash pipes and (4) solid shafts.

» «

Electronic Heater Bulletin

Application of Allis-Chalmers electronic heaters for the induction heating of metals and the dielectric heating of non-metallic materials is explained in a recently issued four-page, letterhead-size bulletin, B6372. Illustrations show typical production set-ups of the standard 20 kw heater, including brazing applications. **Allis-Chalmers Mfg. Co.**, Milwaukee 1.

» «

Heavy-Duty Induction Heating

Information on mercury-arc converters designed for induction-heating operations in the 500 to 2,000 cycle frequency range is presented in an eight-page, letterhead-size bulletin, B6373, available from the **Allis-Chalmers Mfg. Co.**, Milwaukee 1. The new "Excitron" mercury-arc converter is built to supply power for induction heating in blocks of 250, 500, 1,000 kw and higher. Basically, it is the same equipment being used by steel mills, mines, electrochemical plants, etc., to get d-c power from a-c sources.

» «

Flux Folder

A folder 3¼ by 6 in. (folded size) gives detailed information on the "Anti-Borax" line of oxy-acetylene welding and brazing fluxes. The fifteen fluxes described are for: welding cast iron; brazing brass, bronze, copper, steel, malleable iron; welding brass, bronze; brazing cast iron; welding cast or sheet aluminum; welding all grades of steel; welding stainless steel; silver soldering; tinning; welding burnt cast iron; brazing extruded bronzes; brazing aluminum bronze and silicon bronzes; welding magnesium alloys; etc. **Anti-Borax Compound Co., Inc.**, Fort Wayne, Ind.

» «

White Wartime Booklet

An interesting 16-page, 10 by 7 in. booklet, "White Reports on Its Five Wartime Assignments," presents in Life Magazine pictorial style the story of White Motor products and services in connection with the war. Combat units described and illustrated include the four-wheeled scout car, half-trac reconnaissance vehicles and personnel carriers, half-trac gun carriers, six-wheeled prime movers and smaller "444's" for trucking supplies to the fighting front. **The White Motor Co.**, Cleveland 1.

Rutile gains valuable new properties through research:

Ruflux

TAMCO is...and has been for a number of years... the largest supplier of titanium compounds used in welding rod formulation, such as rutile, potassium and sodium titanate. Also, we furnish alloys such as 40% low carbon ferro titanium, nickel and manganese titanium for special coating formulation and compounds such as zircon, potassium zirconate, etc. Manufacturing operations covering these compounds are carefully controlled, and uniform products are assured at all times.

RUFLUX P A potassium titanate containing approximately 73% TiO_2 and 19% K_2O. This compound is used for arc stabilization purposes and contains no injurious impurities. Ruflux P is milled to approximately 4% on a 200 mesh screen.

---

1. **Ruflux 61**—A 93% to 95% TiO_2 containing rutile milled to from 0.5% to 1½% on a 200 mesh screen. Major impurities are SiO_2, $ZrSiO_4$, Fe_2O_3 and FeO. Injurious impurities such as S. and P_2O_5 are kept to a minimum.

2. **Ruflux 84**—A 93% to 95% TiO_2 containing granular rutile of similar analysis to Ruflux 61. This coarser rutile is used to avoid coating dry cracking.

3. **Ruflux S**—A sodium titanate containing approximately 80% TiO_2 and 15% Na_2O. Another arc stabilizer and formulated to reduce hycroscopic action to a minimum.

4. **Ruflux Z**—A zirconium silicate containing approximately 65% ZrO_2 and 34% SiO_2 combined as $ZrSiO_4$. The compound is milled to 0.10% on a 325 mesh screen and due to its high melting point (3850 F°.) is used as a slag stiffener.

5. **Ruflux P. Z.**—A potassium zirconate containing 80% to 81% ZrO_2, 14% to 15% K_2O, 3% to 4% SiO_2 and smaller percentages of TiO_2, Fe_2O_3, CaO, etc.

6. **Ruflux T**—A zirconium oxide containing from 90% to 91% ZrO_2, 5.00% SiO_2, 0.80% Na_2O and lesser percentages of TiO_2, CaO, Al_2O_3, etc. Ruflux T is milled to 0.1% on a 325 mesh screen.

7. **40% Low Carbon Ferro Titanium**—containing from 38% to 42% Ti., 3% to 5% Si., 6% to 9% Al., 1% to 2% Cr. The alloy is milled to minus 80 mesh.

8. **Tam Nickel Titanium**—contains from 25% to 28% Ti., 60% to 65% Ni., 6 to 8% Al., 2% to 4% Si., and 2% to 5% Fe. The alloy is milled to minus 80 mesh.

9. **Tam Manganese Titanium**—contains from 27% to 29% Ti., 35% to 40% Mn., 20% to 25% Fe., 7% to 9% Al and 2% to 4% Si. The alloy is milled to 80 mesh.

Tamco also manufactures alloys such as Ferro Carbon Titanium, Bortam and boron containing titanium alloys, and various other titanium and zirconium compounds.

We will be glad to produce any other titanium and zirconium compounds of interest to the welding rod industry as soon as the emergency is over.

It pays to include these compounds in your welding rod coating formulation research.

THE TITANIUM ALLOY MANUFACTURING COMPANY

Executive Offices: 111 Broadway, New York, N. Y. *General Offices and Works:* Niagara Falls, N. Y.

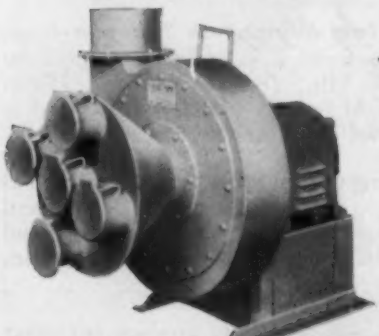
The General Says

ATTENTION

Write today for the complete information which General Blower Co. has prepared for you regarding

GENERAL WELDING FUME EXHAUSTERS

Ask for Portfolio CB-103—W.E.



High Velocity Exhaustion by High Speed Centrifugal Fans 2 to 10 Inlets

GENERAL BLOWER COMPANY

Producers Of Air Moving Equipment

401 North Peoria Street Chicago 22, Illinois

News of the Industry

Detroit, Cleveland AWS Hold Annual Conferences

In keeping with their established traditions, the Detroit and Cleveland sections of the American Welding Society turned their annual meetings into conference-and-dinner combinations.

The Detroit meeting, the second annual welding conference for this section, was held on the afternoon of May 4 at the Rockham Memorial Foundation. Following the afternoon technical session was a dinner attended by 285 guests.

L. A. Danse acted as technical chairman of the afternoon meeting, at which three papers were presented: "Methods of Joining Aluminum" by C. O. Hoglund; "How to Control Welding Distortion" by Charles H. Jennings; "New Phases of Resistance Welding" by R. T. Gillette.

Austin Grant, popular Detroit radio announcer, served as toastmaster and chairman of the dinner, which was enlivened by C. M. Ripley's "Believe It or Not" presentation of modern electrical developments. This Ripley is power engineer of the General Electric Co. and is not to be confused with the well-known cartoonist.

The seventh annual welding conference of the Cleveland section was an even more elaborate affair, comprising an afternoon technical session, a dinner and an evening meeting. Attendance totaled around 150 at the day technical session and about 400 at the dinner and evening session.

Three papers were presented at the afternoon session: "AWS specifications as a Guide in the Selection of Welding Electrodes" by Henry O. Westendarp, Jr.; "Use of Propane as a Fuel Gas for Flame-Cutting" by Harris A. Goodwin II; "Design for Resistance Welding" by George N. Sieger. Malcolm S. Clark served as chairman.

H. E. Hopcraft, Cleveland Worm & Gear Co., served as toastmaster at the dinner, at which A. C. Weigel, national AWS president, delivered a brief message. Dr. Howard E. Fritz, B. F. Goodrich Co., presented a paper, "The Accomplishments of Modern Research," at the evening session.

» «

British Now Active in Marine Salvage

On the termination of hostilities with Germany, Britain had the finest and largest fleet of salvage ships and craft available anywhere, a great amount of special equipment and a surplus of skilled and experienced salvage personnel. The extent of the British Admiralty's salvage and rescue tug service is indicated by the fact that from September, 1939, to December, 1944, over 5,000,000 tons of merchant shipping were salvaged—a tonnage about equal to the building of new merchant ships in the United Kingdom in the same period.

A new electric oxy-arc cutting torch and an arc process for underwater welding are included among Britain's wartime contributions to salvage equipment.

» «

30,000,000 Ft of Cable Speed Wartime Welding

Thirty million feet of welding cable—enough to stretch over nearly a quarter of the earth's equatorial circumference—have been made by the Belden Mfg. Co., Chicago, since the start of the war, according to H. W. Clough, vice-president. Production is continuing at full capacity, Mr. Clough said.

Prior to the war, Belden had anticipated the growing demand for electric welding cable by investing some $350,000 in new plant capacity and machinery. The company's research and engineering departments developed an improved type of insulation fabricated from synthetics, which is said to meet the requirements of hard usage even more effectively than natural rubber.

» «

Lincoln Foundation Announces Agricultural Award Program

A $37,500 award program to encourage investigation, study and scientific development of arc welding in farm operation and maintenance has been made by The James F. Lincoln Arc Welding Foundation, Cleveland. There are 131 cash awards in each of two divisions: (I) those actively engaged in agriculture and (II) those engaged professionally in agricultural education or services. The cash awards in each division are: first, $3,000; second, $2,000; third, $1,000; fourth, $750; fifth, $500; sixth, $250; twenty-five $100 awards and 100 awards of $50 each. In addition, 30 scholarship awards totaling $7,500 are offered for the colleges of agriculture in the states in which the award winners reside.

The awards will be made for papers describing the application of arc welding to the maintenance of farm equipment, machinery or farm structures. Consideration should be given to such factors as: procedures, methods, materials, electrodes, savings in both time and money, type of welding equipment best adapted, suggestions for new equipment and accessories, any factors dealing with the learning of welding.

» «

Moves Philadelphia Office

Mine Safety Appliances Co., Pittsburgh, has moved its Philadelphia office to 5564 Baltimore Ave., Philadelphia 43.

MONEY TO BURN?

ACETYLENE *Sight Feed* GENERATORS

● The next time you light your acetylene torch, take a look at that flame. If you're still using "bottled" acetylene, you're burning DOLLARS—you know: those bits of green paper which seem so plentiful these days, but which never come so fast but that you could always use a few more.

If you'd just make your own acetylene with a SIGHT FEED portable generator, you could put about two-thirds of each of those acetylene dollars in your cash register where they belong. You'd have an unlimited supply of top-quality gas for your welding and cutting; and don't forget: it's PORTABLE!

If you'd like to have more information, contact your jobber or

THE SIGHT FEED GENERATOR COMPANY
RICHMOND, INDIANA

See **THIS FIXTURE FOR AUTOMATIC WELDING!**

A BIG TIME SAVER!

THIS Acme dual fixture arrangement permits practically constant use of an automatic welding head, because one of the fixtures can be reloaded while the other is engaged in the welding operation.

The holding machine can be set to revolve at any angle from vertical to horizontal. (Illustration shows a wheel being welded at 45° angle.) Positioner arm swings from one fixture to the other, locking in proper position. Speed of rotating the work is adjustable, as desired.

WRITE
for information relating to your particular welding fixture problem

Automatic Welding-head Positioner — adaptable to your own holding fixture.

Reloading Is Done During Welding Operation

ACME *Manufacturing Co.*
1642 HOWARD ST. • DETROIT, MICH.

"Shrink" Is the Villain of New Lincoln Movie

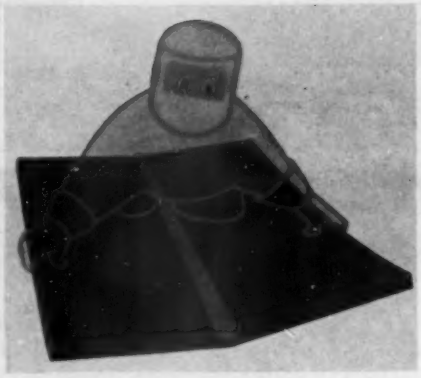
To promote a more widespread understanding of the causes and prevention of distortion, Lincoln Electric is sponsoring a new 16 mm sound, color motion picture produced by Walt Disney Productions. The villain of this film story is "Mr. Shrink," an animated character who symbolizes the cause of all distortion in arc welding. He causes a great deal of trouble but is thwarted at every turn and is even unknowingly put to work to overcome distortion in several cases.

In accordance with its title, "Prevention and Control of Distortion in Arc Welding," the movie points out how distortion can generally be prevented in any product or structure by the application of three simple rules:

"I. *Reduce the Effective Shrinking Force.* Do not overweld. Use proper edge preparation and fit-up. Use few passes. Place welds near the neutral axis. Use intermittent welds. Use back-step welding methods.

"II. *Make Shrinkage Forces Work to Minimize Distortion.* Locate parts out of position. Space parts to allow for shrinkage. Prebend or prespring the parts to be welded.

"III. *Balance Shrinkage Forces with Other Forces.* Use proper welding sequence which places weld metal at different points about the structure so that as one section of weld metal shrinks it will counteract the shrinkage force of previous welds. Peen the weld bead. Use jigs and fixtures to hold work rigid while welding."



"Mr. Shrink," villain of the Lincoln distortion film, personifies weld shrinkage forces.

The film was produced for showings to schools, colleges, technical societies, factories, shipyards and industrial groups. It has a running time of 20 minutes and is available at no cost (except for transportation) upon request to The Lincoln Electric Co., 12818 Coit Road, Cleveland 1.

» «

Eisler Celebrates 25th Anniversity

Standing at the threshold of a new and more promising advancement in its special field of equipment for radio tube manufacture, the Eisler Engineering Co., Newark, is commemorating a quarter of a century of service to industry with a special anniversary catalog. This book contains more than 4,000 machine and methods illustrations.

The company was founded by Charles Eisler in June, 1920, to specialize in the design and manufacture of automatic machinery essential to the mass production of incandescent lamps, radio and electronic tubes and accessories. Spot and butt welders, bench welders and resistance-welding transformers are included among the many types of machinery developed.

» «

Westinghouse Electric Changes Company Name

Stockholders of the Westinghouse Electric and Mfg. Co. voted at their recent annual meeting to change the company's name to Westinghouse Electric Corp., for the sake of simplicity and brevity. A decision was also reached to split the company's stock on the basis of four shares for one in order to broaden the base of Westinghouse ownership by making the stock available at a lower price.

» «

Pacific Engineering Corp. Moves Sales Facilities

The sales division of the Pacific Engineering Corp., Los Angeles, has been transferred from the plant at 3123 San Fernando Road to 1100 Equitable Bldg., Hollywood and Vine. Sales Manager Carl E. Swift will direct the firm's sales program from the new quarters in the center of Hollywood's business district. Among other products the company manufactures an electrode holder.

DOCKSON FACE SHIELDS

No. 1135C for light polishing, buffing, etc.

No. 1165 for Oxy-acetylene welding

DOCKSON'S featherweight face shields are designed and constructed for maximum safety, convenience and comfort. Their many advantages are the result of Dockson's long experience in face shield manufacture.

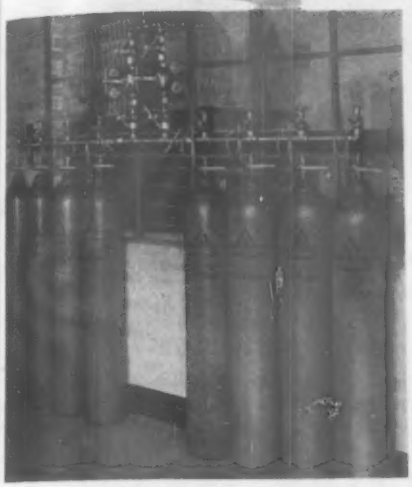
Desirable dealer territories open

Materials are the best available. Headgears are light, comfortable and easily adjustable. Windows are available in a full range of green shades, .020 thickness, or in clear acetate, .020 or .050 thickness, as desired. Standard lengths 4" and 6".

Stocked by a Dockson Dealer near you.

DOCKSON CORPORATION
3839 Wabash • Detroit 8, Mich.

Are YOU SURE THEY'RE "MT"?



● The odds are against your cylinders being "MT" if you don't have a modern manifold installed in your shop or plant.

Learn *now* how a RegO Manifold, designed to your exact requirements, can cut your gas costs by withdrawing *all* the gas from *all* the cylinders . . . there's no obligation . . . simply write.

REGO — ARMY E NAVY

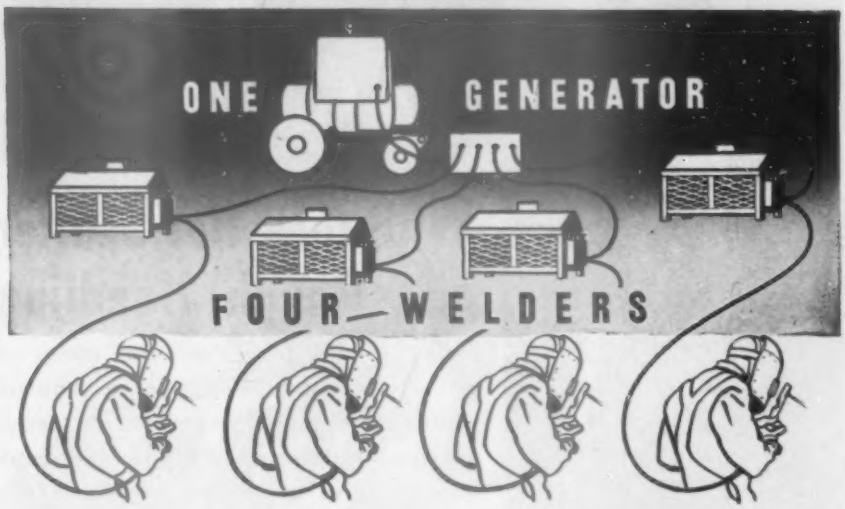
The BASTIAN-BLESSING Company

4239 Peterson Ave. · Chicago 30, Ill.

Pioneers and Leaders in Equipment for Using and Controlling High Pressure Gases

THE BIGGEST NEWS IN WELDING TODAY!

STEVENS TUFFLINE WELDING RESISTOR UNIT



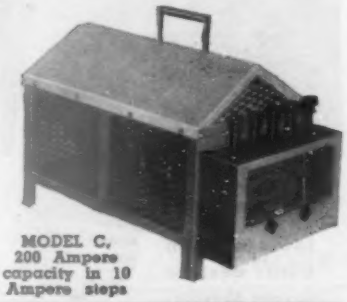
IMMEDIATE DELIVERY

$96.00 LIST PRICE

Discounts on Request

Generators are hard to get . . . expensive. Even with high priorities, deliveries are long delayed and uncertain. The remedy for this situation is to install STEVENS TUFFLINE WELDING RESISTOR UNITS. They multiply your generating capacity by 3 and 4 times at a small fraction of the cost of additional generators.

Thousands of Stevens Welding Resistor Units are working night and day on production lines from coast to coast, including nearly 75% of the nation's shipbuilding concerns. Demonstrations of any Tuffline product given without obligation. Catalogs showing all Tuffline products sent upon request.



MODEL C, 200 Ampere capacity in 10 Ampere steps

C. H. STEVENS & COMPANY 15 ANN ST., SOUTH NORWALK, CONN. TEL.: NOrwalk 6-3315 SACRAMENTO, CALIF.: 3216 SACRAMENTO BLVD., SACRAMENTO 5-2388

New Control Eliminates Hazard of Welding Shock

The danger of electrical shock from an arc welder is said to be entirely eliminated by a new safety panel invented and perfected by electrical engineers of the Michigan City, Ind., plant of the Pullman-Standard Car Mfg. Co. An explanation of how the device works was given by A. C. Lohse, general power engineer. When the welding contact is broken, the safety panel automatically reduces the machine's open-circuit voltage from the 85 to 110 volt level to a mere 24 volts. This is done by isolating the open-circuit voltage from the electrode holder as soon as the operator breaks the arc. A control voltage of 24 volts is then automatically impressed on the electrode cable. When the electrode again contacts the work, the welding transformer is again connected to the electrode and welding proceeds as before.

"The risk of shock is greatest," explained Mr. Lohse, "when the operator disengages the work in order to replace burned out electrodes. Without the new safety panel, he is in danger of receiving the full 110 volts when he performs this operation. Should his clothing be wet from perspiration, or if he should be grounded by leaning against or kneeling on the metal being welded, a serious shock might result. Accidents such as these are rare, but it is the purpose of our safety engineers to eliminate every possible hazard. Furthermore, the relief in nervous tension is quite noticeable throughout all of our plants."

» «

Revokes L-298 Order on Resistance Welding

Revocation of Limitation Order L-298, which set forth required specifications and schedules covering resistance-welding equipment, was announced on May 14 by the War Production Board. The manufacture and delivery of the equipment remains subject to all other applicable regulations and orders, WPB cautions manufacturers.

» «

Budd Plans to Resume Railway Car Building

The Edward G. Budd Mfg. Co., Philadelphia, will resume the manufacture of lightweight stainless-steel railway passenger cars just as soon as manpower and materials are available, President Edward G. Budd announced last month. The announcement said that railway passenger cars for both day and night occupancy would be included among the postwar products.

» «

Hobart, Oklahoma City, Moves to New Address

Hobart Welder Sales & Service, Oklahoma City, Okla., has moved to a new office and sales room at 518 S. Robinson St. The office is in charge of C. H. Minton, who has been a Hobart representative in the Oklahoma City district for more than eight years. Gene Bryan, formerly of Tulsa, has joined the company in a sales and service capacity.

» «

Western Metals Parley in Seattle June 21-22

A two-day conference on the wartime development and postwar prospects of the West's light metals industry will be staged in Seattle on June 21 and 22. Attending will be leading producers, technologists and economists in the light metals field, government officials charged with the disposal of surplus war property and several western senators and congressmen.

» «

Stow Mfg. Co. Opens San Francisco Branch

The Stow Mfg. Co., Binghamton, New York, has opened a new service branch at 1401 Third St., San Francisco. Warehousing facilities are included to provide speedy delivery of flexible shaft equipment used in ships, industrial plants, etc.

» «

Alloy Rods Co. Appoints New Chicago Distributor

Alloy Rods Co., York, Pa., has appointed the Johnson Welding Equipment Co., 2640 West Van Buren St., Chicago, distributor in this city for "Arcaloy" stainless-steel and tool-steel welding electrodes. This distributor will give complete welding and distribution service. The manufacturer's Chicago office, formerly located at 3548 Archer Ave., has been closed.

PROOF

Lower lamp still burns despite severe service.

Withstand Hot Spatter and Rough Handling

Here is a lamp for welders that stands up under the most gruelling service. Radiant Spatterproof Lamps are built of special glass to resist hot metal spatter and rough handling to a degree never before achieved. Radiant Spatterproof Lamps increase production by reducing delays due to lamp replacement. A trial order will prove the economy of Radiant Spatterproof Lamps. Available in 50, 75, 100, and 150 W sizes.

RADIANT LAMP CORPORATION

Lamps from 50 to 10,000 watts

300 Jelliff Avenue Newark 8, N. J.

All are C-F POSITIONERS

2500 LBS. 6000 LBS. 6000 LBS.

Modern welding specifications call for "positioned welding throughout," and today in all parts of the country, we find endless streams of war materials coming off production lines of C-F Welding Positioners. Some of these lines are blocks long and made up of identical positioners on each of which is built a complete unit. In others like the 3 positioner sub-assembly line above, the C-F Positioners are progressively larger as the weldment increases in size and weight.

In planning your post war set-up, remember that there is a C-F Positioner exactly suited to every requirement, that each is a universal tool, operated by the welder himself by push button or hand wheel control, that all are adjustable for height, all rotate a full 360°, all tilt 135° beyond horizontal.

other C-F Positioner capacities:
1,200 lb.
14,000 lb.
20,000 lb.
30,000 lb.
Write for Bulletin WP-22

CULLEN-FRIESTEDT CO. 1309 S. Kilbourn Ave., Chicago 23, Ill.

TRI-FLUX

A NEW AND BETTER SOLDERING FLUX

No. 5 FOR STAINLESS AND MONEL METAL

No. 3 TRI-FLUX (Regular) FOR ALL OTHER METALS

No. 20 TRI-FLUX (Neutral) NO AFTER CORROSION

ONE APPLICATION { CLEANS / REMOVES RUST / FLUXES

TRI-FLUX is amazing in its simplicity, efficiently performs three distinct jobs and is extremely economical. Saves time and money—no waste. Truly the most etching flux ever developed. TRI-FLUX cleans, removes rust and fluxes all in one operation. TRI-FLUX made in single strength for steel, iron and other metal surfaces. TRI-FLUX No. 5 especially designed for stainless steel and monel metals.

Tri-Flux Advantages

- No need to pre-clean with acid, or oil solvent
- Sticks to wet surfaces. Can be applied without first drying surface
- Can be applied to oily surface without wiping off first
- Sticks to vertical surfaces as well as horizontal. Won't run off
- May be used for hand or torch soldering
- Saves time—one application does three jobs
- Has no injurious effect on surfaces of metals
- Economically applied—put on with brush—no waste
- Will not spoil by standing
- No disagreeable odors

DISTRIBUTORS
Please Write Us
For Prices, Etc.

THE WOLFE-KOTE CO.

SHEBOYGAN • WISCONSIN

Mir-O-Col Names New Distributor

Blackwell & Sunde, Inc., 3135 Cherry Ave., Long Beach, Calif., has been appointed distributor of "Mir-O-Col" hard-facing electrodes in the oil field area of Orange and Los Angeles counties.

» «

Safety Color Code Submitted to ASA

A War Committee of the American Standards Association, which has been working for some months at specific request of the War Department on a safety color code for marking physical hazards, voted at a recent meeting to submit its newly drafted standard for approval as an American War Standard.

Briefly, the proposed standard is a codification of certain already widely recognized concepts regarding the use of color for safety purposes. Red is used to identify fire-protection equipment and apparatus, to show danger and to indicate "Stop." Yellow indicates caution and is used for marking physical hazards which might cause stumbling, falling, tripping, etc. Green indicates safety and the location of first aid equipment. White, black or a combination of the two are used for housekeeping and for traffic markings.

The exact shades of colors selected are being left to a subcommittee chairmanned by Harry J. Keegan of the National Bureau of Standards. The subcommittee's job is to choose colors that are not only vivid enough to catch the eyes of normal persons but are also distinguishable to the largest percentage of color-blind persons.

To the Editor

"The electric welding industry is very greatly handicapped because of the lack of a usable technical standard for arc-welding electrodes. The only attempt toward such a standard is the present 'purchase specifications' gotten out by the Filler Metal Committee of the American Welding Society. These do not attempt to be technical standards and cannot be used for the control and proper inspection of electrodes in normal operations.

"The greatest use for a technical standard usually is its use as a means for checking the quality of a product, at any time, under normal operating conditions.

"It is true there have been no failures that would indicate shortcomings of electrodes which have been produced. The arc-welding industry has been particularly free from questionable performance, yet there are many things which can happen to electrodes even after they have been produced which might interfere with their usefulness. A check to determine their quality at the time of use therefore is helpful.

"The following suggestions would seem a possible direction in which the standards should go:

"First. The deposited weld metal with equal section should be strong enough to break the parent metal.

"Second. A minimum elongation of 25% in the outside fibers by bending the welded joint in any direction.

"These standards would indicate that the material is both in proper condition for welding and is of the proper kind for the particular purpose. Such tests could be easily and quickly applied by any one under almost any conditions in field operations."

J. F. LINCOLN, President,
The Lincoln Electric Co.

ABOUT PEOPLE

Benjamin O'Shea and **Fred H. Haggerson** were re-elected chairman of the board and president respectively of Union Carbide and Carbon Corp. at a recent organization meeting of the board of directors. All of the other officers of the corporation were re-elected, including **James A. Rafferty,** vice-president; **Ralph R. Browning,** vice-president; **Paul P. Huffard,** vice-president, and **Robert W. White,** vice-president, secretary and treasurer.

» «

Kenneth I. Thompson, formerly western manager of the railroad department of Ingersoll-Rand Co., has joined the sales staff of The Oxweld Railroad Service Co. as eastern sales manager. His headquarters are in New York City.

» «

Boyd V. Giesey has been appointed to head the recently expanded flash-welder division of Progressive Welder Co., Detroit. He was formerly senior design engineer of Taylor-Winfield Corp., specializing in the design and development of flash welders.

» «

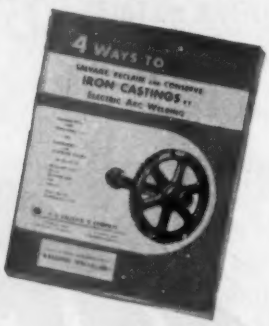
Gorham W. Woods has joined The Lincoln Electric Co., Cleveland, as research engineer and will devote a major part of his time to the development of electrodes. He served as chief chemist and development engineer of the Hughes Tool Co., Houston, Tex., and more recently as process engineer of the Dickson Gun Plant, a Hughes-operated concern. In 1940-41 he was chairman of the South Texas section of the American Welding Society.

» «

Walter Pestrak and **Paul L. Duer** have formed a partnership to represent Progressive Welder Co., Detroit, in eastern Ohio and western Pennsylvania. The new firm, the Duer Engineering Co., will maintain offices at 1015 Mahoning Bank Bldg., Youngstown 3. Mr. Duer has been field sales engineer for Progressive in this area for the past several years. Mr. Pestrak was formerly senior welding engineer of The Federal Machine & Welder Co.

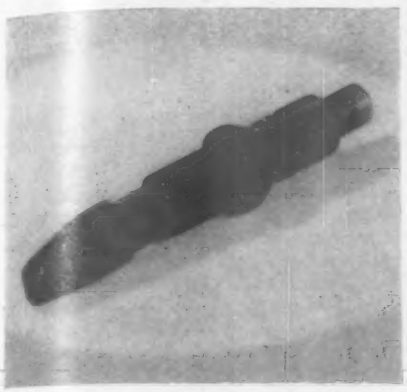
Learn to Arc Weld Cast Iron
with
PHILLIPS "600" Electrode
to
Save Time
Avoid Distortion
Get Machinable Welds

ARC welding with PHILLIPS "600" is the preferred method in foundries for salvaging gray iron castings because deposits from this electrode are (1) of the color of cast iron, and (2) fully machinable, even through the line of fusion. The same qualities recommend PHILLIPS "600" to machine shops, tool rooms and welding repair shops. Our nearest distributor will be glad to show you how easy it is to apply.



Our "4-Ways" manual is a complete guide to the selection of materials and procedures for arc welding cast iron. Send for your copy TODAY.

C. E. PHILLIPS & COMPANY
2750 Poplar Street, DETROIT 8, MICH.
332 S. Jefferson Ave., CHICAGO 6, ILL.
MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES



Before

— *Safe and Easy*

TAKE A TIP – USE "TIP CLEEN"

Due to the extreme heat of the torch, impurities and deposits settle in the nozzle and in time clog it up.

Tip Cleen Removes these deposits Easily . . . WITHOUT HARM TO THE TIPS.

Tips already thrown into the discard because their clogged condition made cleaning seem impossible Have Been Cleaned Easily With Tip Cleen.

Just Think Of The Economy . . . Not Only In The Number Of Tips Saved But Also In Labor And Delays!

Save——Time——And——Money

New, Simple, Easy . . . No Harm to Tips

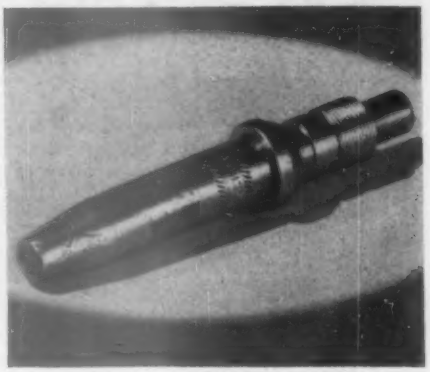
Old methods frequently used Strong and Injurious Acids . . . Tip Cleen is absolutely Non-injurious to the tips. Drills have been used, but they injure the passages by breaking off and by changing the tapered tolerances.

To clean Tips by this new method, merely heat Tip Cleen to 165 degrees Fahrenheit, drop in tips for ½ hour, remove tips and rinse in cold water. Blow out with air hose. THEY WILL BE AS CLEAN AS NEW . . . No impurities will remain in the air passages . . . it will shine like a new rifle barrel.

Be Convinced At No Cost To Yourself . . . Send For A Free Sample Today.
Weight approximately 50 lbs. per shipping case. Packed in gallon containers 4 to the shipping case.

SHEBOYGAN **WOLFE-KOTE CO.** WISCONSIN

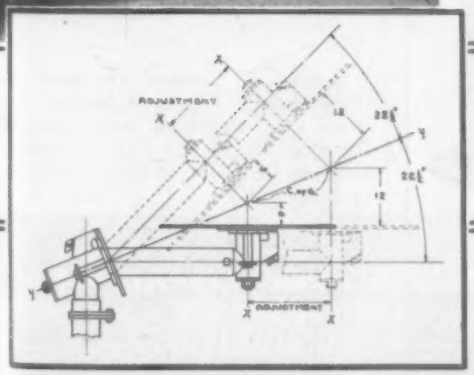
Makers of CORE CLEEN, CARBON CLEEN, GREASE CLEEN



After

New... BALANCED Positioning

● Speeds your work by providing *finger tip manipulation* through 360° of rotation and 135° of tilt. No air or hydraulic cylinders, or electric power needed. Tilting spindle is *below* the face plate to permit mounting of long structures. Provides all-position down hand welding for better welding at reduced cost. Capacity of model No. 5 illustrated is 500 lbs., with center of gravity from 6" to 12" above the face plate. 150 lb. capacity also available.



Work is located on the face plate to balance about Rotation Spindle Axis X-X. Horizontal telescopic arm is adjusted to balance work about Tilt Axis Y-Y. **Center of Gravity** stays in **one position** through all manipulations. Work can be locked into position at 15° intervals of rotation or tilt. Other spacing provided if desired. Friction brakes provide drag where locking is not needed, as in shot blasting and spray painting.

Bentley Provides Balanced Positioning

BENTLEY WELDERY, Inc.

BOX 1038 Dept. C SYRACUSE, N. Y.

A. J. Aulerich and **William F. Grimes** have formed the firm of Aulerich and Grimes to represent Progressive Welder Co. in the western Ohio industrial area. Mr. Aulerich has represented Progressive in Ohio for many years, and Mr. Grimes was formerly welding engineer of the National Cash Register Co. Headquarters of the new firm will be at 8070 E. Circle Drive, Dayton.

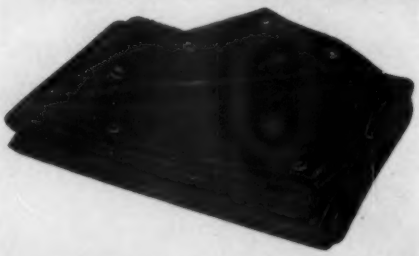
» «

Lloyd B. Smith has been elected vice-president and member of the board of the A. O. Smith Corp., Milwaukee. He is the son of the late L. R. Smith, for many years chairman of the board of this concern. **Morris J. Vollmer,** formerly assistant to the president, was named assistant secretary and assistant treasurer, and **A. von Wening,** vice-president and controller, was elected to the board.

» «

Elmer A. Terwell has been appointed assistant manager of the Chicago plant of Salkover Metal Processing, a commercial electric-furnace copper brazing firm. He was connected for 20 years with the Chicago office of The Driver-Harris Co. and also served as secretary-treasurer of the Chicago chapter of the American Society for Metals during the period from 1938 to 1941.

"SAF-T" CURTAINS for Welding Plants



Made of fine quality, heavy flame-proof duck.
Any size required.
Equipped with grommets ready to hang.
Color: Olive Drab.
SOLD THROUGH YOUR LOCAL JOBBER

Write for prices and descriptive material.

FRED JESSAR
404 Denckla Bldg. Philadelphia 7, Pa.

SEND FOR DETAILS
ON THE
COMPLETE LINE
OF
LARKIN
SPOT WELDERS
FROM
10-50 KVA
MANUAL, AIR AND MOTOR OPERATED MACHINES.
LARKIN A.C. ARC WELDERS FOR EVERY NEED

● LARKIN MODEL # R 12

LARKIN LECTRO PRODUCTS CO., MANUFACTURERS
220 Taaffe Place, BROOKLYN 5, N. Y. ● Sales offices throughout the country

L. P. Schrubey has been transferred from the accounts service department of Ampco Metal, Inc., Milwaukee, to the Newark field engineering office, 1060 Broad St., Newark 2. **W. F. Taff** has been transferred from the Newark office to the Cincinnati office, 541 Main St., Cincinnati 2, where he will work as field representative. **Baxter Schroeder** of the Cincinnati office has been transferred to Milwaukee, where he will be field engineer for the "Ampco-Trode" department, working with users of coated aluminum-bronze rod.

» «

Joseph H. Hayden, formerly secretary, has been promoted to the position of vice president of Hewitt Rubber Corp., Buffalo, N. Y. **William H. Watkins,** head of the accounting department, has been named controller and assistant treasurer. Mr. Hayden joined Hewitt immediately after service in the first World War. He became manager of the company's New York office in 1925, later returned to the Buffalo headquarters. In assuming his new position, he retains the title and duties of secretary. Mr. Watkins will complete his twentieth year of service with Hewitt this year.

» «

G. W. Sloan, for the past several years a field engineer covering the entire United States for Jackson Products, Detroit, has taken the position of field engineer for the western territory and will be permanently located in Los Angeles. **L. J. Blackford** becomes field engineer for the eastern territory and will cover the eastern seaboard with headquarters in Philadelphia. He was formerly with the Ingalls Shipbuilding Corp., Pascagoula, Miss.

» «

J. L. Mullin has been promoted from general superintendent of foundries to vice-president in charge of operations of the American Manganese Steel Division of the American Brake Shoe Co., Chicago Heights, Ill.

» «

Earl W. Pierce, formerly assistant to the general superintendent, has been appointed chief metallurgist at the South Chicago plant of Carnegie-Illinois Steel Corp. He is succeeded as assistant to the general superintendent by Tom J. Peters, formerly assistant superintendent of the maintenance division.

» «

Robert E. Cramer has been named chief engineer of the American Steel & Wire Co., Cleveland, succeeding E. J. **Reardon,** resigned. Mr. Cramer was formerly engineer of appropriations and properties.

» «

Brice R. Freeman, formerly in charge of personnel for the Cleveland Diesel division of General Motors, has been appointed director of industrial relations at the Warren City Mfg. Co., subsidiary of Graham-Paige Motors Corp.

A WORKING AID FOR PRODUCTION WELDERS

M·S·A FEND L

BARRIER SKIN PROTECTION

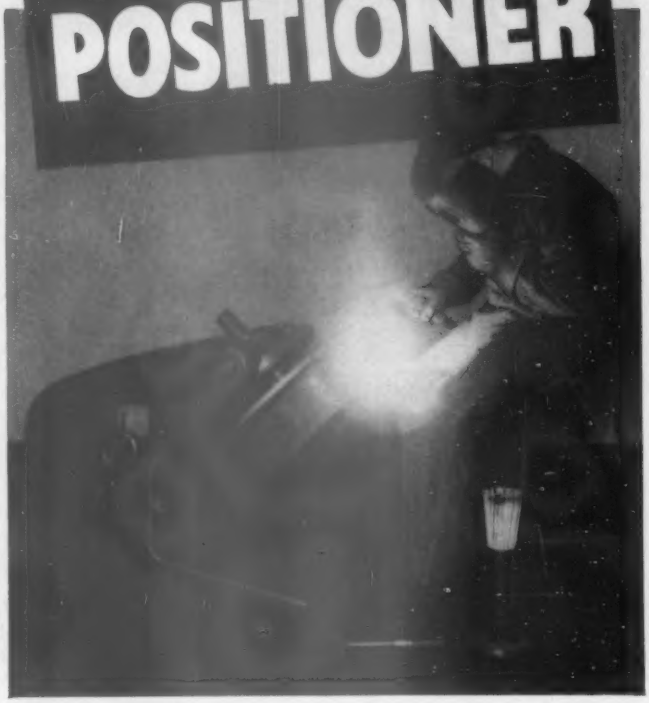
AGAINST IRRITATING

WELDING FLASHES

The irritant action of the rays from welding flashes on your workers' skin can be guarded against effectively by the regular use of this specialized Fend Protective Skin Cream. Applied to clean, exposed skin before beginning work, Fend-L rubs in easily, creating a physical barrier which screens out harmful welding rays. Bland and emollient, Fend-L is readily removed at the end of work period with mild soap and warm water, leaving the skin in soft and smooth condition. Write for the latest Bulletin on the complete line of Fend Barrier Protection Creams and Lotions.

MINE SAFETY APPLIANCES CO.
BRADDOCK, THOMAS AND MEADE STREETS
PITTSBURGH 8, PA.
District Representatives in Principal Cities

"Standard"
WELDING
POSITIONER



Completely Powered

- Easy and instant control of rotation, elevation and tilting of work up to 700 lbs.
- Rotating speeds from 0 to 2.4 R. P. M. for linear speeds from 0" to 180" per minute in either direction.
- Table heights adjustable between 30" and 36".
- Table hydraulically power tilted thru 135° from horizontal and thru complete range of 150°.

Write for catalog

STANDARD
MACHINERY COMPANY

1473 Elmwood Ave., Providence 7, R. I., U. S. A.

AGILE BRONZE ELECTRODES

for the

WELDING OF COPPER, BRASS, PHOSPHOR-ALUMINUM *and* SILICON BRONZES

Agile Bronze electrodes possess a copper-tin-phosphor alloy core wire and are recommended for the welding of steel and cast-iron to bronze.

Preheating is not necessary in the welding of bronze castings up to 1/8" thick. These electrodes give the best results when handled in the horizontal or flat positions. Full information will be furnished on request.

WRITE NOW FOR YOUR CATALOG

AGILE ACTARC

AMERICAN AGILE CORPORATION
5806 HOUGH AVE.
CLEVELAND 3, OHIO

Dr. Robert C. McMaster, formerly associated with the electrical engineering staff of the California Institute of Technology, has been appointed to the staff of Battelle Memorial Institute, Columbus, O. Dr. McMaster is a member of the American Institute of Electrical Engineers, serving on its Electric Welding Committee, and of the American Welding Society, serving on its Resistance and Flash-Welding Committees.

» «

J. Robert Van Pelt, formerly technical director of the Museum of Science and Industry, Chicago, has joined the staff of Battelle Memorial Institute and will assume responsibility for an expanded program of research education.

» «

R. P. Mork has been elected executive vice-president of Crane Co., Chicago. **J. A. Dwyer,** formerly general manager of sales and branches, succeeds Mr. Mork as vice-president in charge of sales. **Lucien W. Moore** succeeds Mr. Dwyer as general manager of sales and branch houses, and **F. J. Wilkey,** formerly district manager, Chicago, has been appointed manager of the valve and fitting department, the position formerly occupied by Mr. Moore.

» «

Frank B. Russell, of Drexel Hill, Pa., has been appointed direct factory sales representative for the United Electronics Co., Newark. He will cover a territory including eastern Pennsylvania, Delaware, Maryland and Virginia.

» «

John A. Goundrey, formerly production manager, tank division, Federal Machine and Welder Co., Warren, O., has been appointed works manager of Diamond Iron Works, Inc., and its Mahr Mfg. Co. division, Minneapolis.

» «

Raymond P. Lansing, vice-president and group executive of Bendix Aviation Corp., Detroit, has been elected a director.

» «

Leonard C. Blevins has been appointed sales manager of the meter division of the Westinghouse Electric & Mfg. Co.

Died . . .

Edmund A. Doyle, consulting engineer for the Linde Air Products Co. and a former president of the American Welding Society, died suddenly at his home on the evening of May 4. He was 64 years old. Mr. Doyle began his association with Linde in 1922 as assistant general sales manager in charge of service. Four years later he became consulting engineer on process development, a position he held until his death. He served as a director of the American Welding Society and was president of that organization in 1930-31. He was also responsible for the organization of the AWS Committee on Building Codes.

POPULAR

Getting workers to wear safety equipment is a constant problem, especially on "semi-hazardous" jobs such as light grinding, woodworking and spot welding. The Willson Protecto-Shield meets this problem because it combines *new comfort* and *smart appearance* with day-long protection for both front and sides of face and forehead.

COMFORTABLE

Both men and women appreciate these comfort features. Light weight. Tilting visor "stays put" in any position. Plenty of room for spectacles. Clear plastic visor free from optical distortion.

PRACTICAL

Exclusive "Slot-Lock" holds visor securely in place. Can't be jarred loose. Easily replaceable. Three visor-lengths —4, 6 or 8 inch. Two thicknesses—.030 or .060 inch. Two colors—clear or green. Visor and sweatband easily replaceable.

For help on eye protection problems, consult your Willson Distributor or write for information to Dept. WE-10.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON
PRODUCTS INCORPORATED
READING, PA. U.S.A. Established 1870

National
Carbide

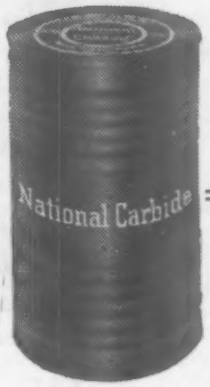
•

EFFICIENT

ECONOMICAL

DEPENDABLE

•



For
Welding and Cutting
Specify

NATIONAL CARBIDE IN THE RED DRUM

•

NATIONAL CARBIDE CORPORATION
60 E. 42nd St., New York 17, N. Y.

The NEW, IMPROVED Variable-Core type
GREYHOUND

A. C. Arc Welders Provide LOWER OPERATING COSTS for HEAVY DUTY PRODUCTION

Detailed information and prices sent on request

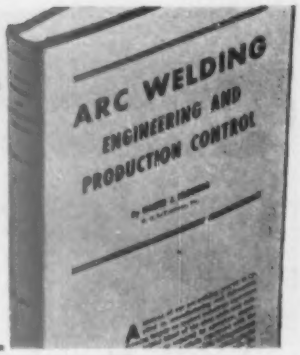
Distributors Wanted

GREYHOUND A. C. ARC WELDER CORP.
Manufacturers
520-28 Morgan Ave., Brooklyn 22, N. Y.

Important

McGRAW-HILL books on WELDING

See them 10 days on approval!



1. ARC WELDING ENGINEERING AND PRODUCTION CONTROL

By Walter J. Brooking, *Director of Testing and Research, P. G. LeTourneau, Inc.*, 347 pages, 5½ x 8, 227 illustrations, $4.00.

Get the facts on arc welding as a major production method. Know the problems to expect, and the solutions to meet them, in arc-welding production and control. Here at your call is a wealth of information on arc-welding specifications, material control and arc-welding specifications, material control and arc-welding costs, jigs and fixtures for arc-welded mass production, the inspection, machining of arc-welded products, the training of arc-welding operators, and a great deal of other valuable data so often learned expensively by experience alone.

2. WELDING AND ITS APPLICATION

By Boniface E. Rossi, *Director of the Welding Division, The Delehanty Institute*. 343 pages, 6 x 9, 319 illustrations, 28 tables, $3.00.

Here is a useful welding manual that serves the needs of all who are concerned with the use of welding and cutting processes—explaining each process and its application according to the main interest of the user. All the different welding and cutting processes, together with their subdivisions, are covered completely and expertly—including their fundamentals, their operation techniques, their related phenomena, their principal applications and general uses, their cost-saving and time-saving characteristics—everything to help you get the best results from each.

3. ARC AND ACETYLENE WELDING

By Harry Kerwin, *Formerly of California Polytechnic School, San Luis Obispo, California*. McGraw-Hill-Whittlesey Practical Manual, 240 pages, 7¾ x 5¼, 201 illustrations, $2.50.

This book analyzes and presents in detail a practical technique for successful welding. Starting from the beginning it covers both arc and acetylene processes giving you methods used in shipyard, aircraft, pipe line, and general maintenance work. It gives you workable methods for controlling expansion and contraction of metals, shows you how to test weld samples, thoroughly explains difficult techniques for arc welding of cast iron, low heat brazing, etc. Provides the beginner with a complete training in practical welding processes—aids the advanced welder to add special fields to his knowledge.

4. ELECTRONIC CONTROL OF RESISTANCE WELDING

By George M. Chute, *Application Engineer, General Electric Company, at Detroit*. 389 pages, 6 x 9, 173 illustrations, $4.00.

Here is an unusually simple and practical manual, fully explaining the tubes and circuits used to control resistance welders in industrial plants. Gives a sound knowledge of tubes and circuits and their application in all varieties of control devices, including synchronous timers and stored energy controls. How the tubes work, power requirements, the factors of good welding involved, installation and maintenance of the devices—everything is covered to give the reader the ability to get the most in long life and efficient service from these equipments.

Send this McGRAW-HILL coupon

McGRAW-HILL ON-APPROVAL COUPON

McGraw-Hill Book Co., 330 W. 42nd St., New York 18
Send me the books encircled below for 10 days' examination, on approval. In 10 days I will pay for books, plus few cents postage, or return books postpaid. (Postage paid on cash orders.)

1 2 3 4

NAME.....

ADDRESS.....

CITY AND STATE.....

COMPANY.....

POSITION.....WE 6-45

(Books sent on approval in U. S. only.)

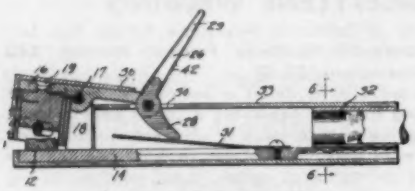
FROM THE PATENT OFFICE

Inert-Gas Electrode Holder

2,376,265. **Russell Meredith,** Los Angeles, assigned to **Northrop Aircraft, Inc.,** Hawthorne, Calif. Filed Feb. 25, 1943. Issued May 15, 1945.

A gas-blanketed arc-welding electrode holder comprising, in combination, an electrically conductive tube and a conduit for an inert gas. The electrode-gripping means is secured to and is electrically in circuit with the gas outlet end of the tube. The gripping means is constructed and arranged to hold an electrode, extending on into the tube and axially in line with it. A tubular nozzle, thermally and electrically insulated from the end of the tube, surrounds the entire electrode-gripping means. A gas passage located behind the electrode-gripping means establishes communication between the interior of the tube and the interior of the nozzle.

» «



Electrode Holder

2,372,113. **John Edward Opgenorth,** Oakland, Calif. Filed Aug. 28, 1943. Issued March 20, 1945.

A pair of jaws carried by a support are arranged for movement to receive and clamp a welding electrode between them. A shell of insulating material is fixed to and encloses one jaw and has an imperforate extension positioned to enclose the other jaw when the two are clamped together upon an electrode.

» «

Electrode Holder

2,372,009. **Edward F. Raymond,** Los Angeles. Filed April 27, 1943. Issued March 20, 1945.

An electrode holder with a tubular body including a pair of relatively axially movable sections. A rod-holding means, receiving current from the conductor and extending into the body, is adapted to releasably retain a rod inserted through an opening in the body. A member rotates about the body to produce relative axial movement of the body sections for releasably engaging the holding means with the rod. A spring resists such relative axial movement of the sections.

Electrode Holder

2,373,232. **Thomas S. Donnelly, Jr.,** Detroit, assigned to **Bordon Mfg. Co., Inc.** Filed Feb. 19, 1943. Issued April 10, 1945.

An electrode holder having a pair of movable gripping jaws urged into gripping relation by a spring. A collar engages each end of the spring, and a flexible sleeve embraces the spring and is turned inwardly at the ends to underlie the two collars.

» «

Cutting Tip

2,373,309. **James K. Hamilton,** Plainfield, N. J., assigned to **Air Reduction Co., Inc.,** New York City. Filed May 26, 1942. Issued April 10, 1943.

A cutting tip having an oxygen passage with a straight side wall throughout its length from its inlet end to the end of the tip and a throat through which the gas flows to the diverging outlet. The ratio of the diameter of the delivery end of the diverging passage to the diameter of the throat is between 1.40 and 1.15. The throat has a straight side wall and is of uniform cross-section substantially throughout its length and of substantially the same diameter as the adjoining end of the diverging passage. The length of the straight side walls of the throat is more than three times the diameter of the opening through the throat.

» «

Gun Welder

2,372,850. **Henry T. Platz,** Detroit, assigned to **Briggs Mfg. Co.,** Detroit. Filed Aug. 10, 1936. Issued April 3, 1945.

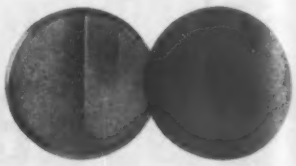
In a welding gun, a movable electrode connected in an electric circuit, fluid-pressure-operated means for moving the electrode in one direction and operating a switch, a manually operable member for admitting pressure, a valve and cylinders. The valve moves in the opposite direction during the manual operation of the member admitting fluid pressure in order to continuously operate the electrode and switch in proper timed relationship.

» «

Cutting Torch

2,372,305. **George L. Walker,** Jersey City, N. J., assigned to **Air Reduction Co., Inc.,** New York City. Filed Nov. 4, 1941. Issued March 27, 1945.

A torch comprising a head, a tip, a pilot light, conduits for conducting preheating oxygen, cutting oxygen and a hydrocarbon fuel gas to the tip and a hydrocarbon fuel gas to the pilot. There is also a valve for controlling the flow of preheating oxygen to the tip, a valve for controlling the flow of cutting oxygen to the tip, a valve for controlling the flow of fuel gas to the tip, and a valve for controlling the flow of a part of the fuel gas to the pilot light as well as a valve-operating means for each of these valves.



W-AL-CO
COVER LENSES

for Gas Welding.
Spatter-resisting or plain.

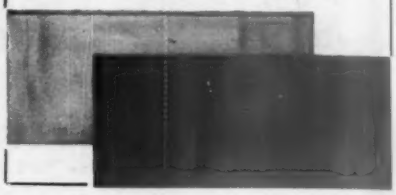
GOGGLE LENSES (50 mm)

Protect Your Vision with the Best in Lenses and Plates

WELDING ALLOYS MFG. CO.
744 Broad St., Newark 2, N. J.

W-AL-CO

SUPER-PLATE FILTER LENSES for Helmets and Handshields.

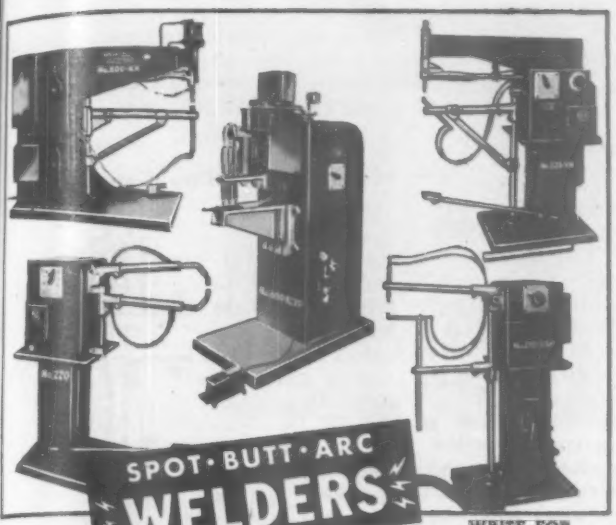


Sold his season's quota in two weeks. His manufacturer uses

COLONIAL
GLOVE AND GARMENT SPLITS

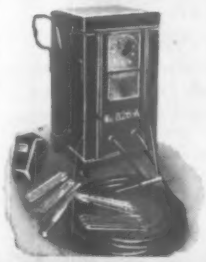
It would make our line easier to sell. Colonial produces large spread whole kips and side splits in Pearl and Fawn. Send for samples.

COLONIAL TANNING CO.
Glove and Garment Leather Division
MILWAUKEE, WIS.



SPOT · BUTT · ARC
WELDERS

WRITE FOR CATALOG



We manufacture a complete line of resistance spot welders from ¼ to 300 KVA for all types of welding. There is an EISLER WELDER for every purpose.

TRANSFORMERS OF ALL TYPES

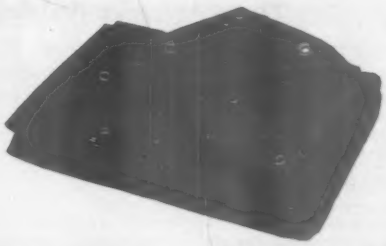
WE INVITE CONTRACT SPOT WELDING IN LARGE OR SMALL QUANTITIES.

CHAS. EISLER
EISLER ENGINEERING CO.
749-50 13th ST. Near AVON AVE. NEWARK N. J.

KRE-CO ALUMINUM BRAZING PROCESS

Nothing tricky about joining aluminum when you use our simple process. The gauge of the metal presents no problem. It is the least costly and most speedy method in use. Operators easily and quickly trained following simple instructions. The process makes brazing possible at a temperature safely below the melting point of the parent metal. Request Bulletin (M 7)

KRE-CO MULTICHEMIC FLUX
DIVISION OF
CHARLES W. KRIEG CO.
52-60 Dickerson St. Newark 4, N.J.



WELDING CURTAINS

By confining the welding operation to a given area, workers and passers-by are protected from harmful rays given off by welding operations.

Also serve as a protective shield against flying chips and scale.

Made of special flameproof and waterproof canvas—or asbestos—complete with eyelets for suspending on rod or pipe support.

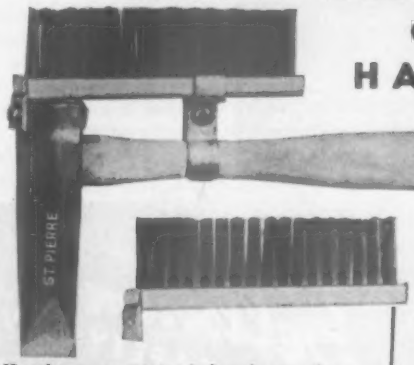
SALVAGE COVERS AND FIRE BLANKETS available of the same materials

WRITE FOR BULLETIN W-65

IPCO
Safety Equipment for all Industries
INDUSTRIAL PRODUCTS COMPANY
2820 N. FOURTH STREET · PHILADELPHIA 33, PA.

ABUSE MEANS NOTHING TO ST. PIERRE

CHIPPING HAMMERS



Here's a man-sized brush in the right position for easy use after chipping scale from welded surface. Hammer-Chisel made of highest quality tool steel. Entire tool is well-balanced. For economy, for durability use ST. PIERRE Hammers.

Breaks the Scale
Cleans the Surface
in One Operation

Order Today From Your Jobber or Direct

ST. PIERRE Chain Corporation
WORCESTER DROP FORGINGS MASSACHUSETTS

12,000 CUSTOMERS

AMONG THEM ARE:— Bureau of Ships, Wash., D. C.; Henry J. Kaiser Co., Calif.; Pacific Bridge Co.; Bethlehem-Hingham Shipyards; Hercules Powder Co.; Stone & Webster; E. I. Du Pont de Nemours & Co.; Crane Co.

COLD PIPE, CONDUIT and TUBE BENDING MACHINES

American Pipe Bending Machine Co., Inc.

13 Pearl St., Boston, Mass.

CLAMPS

"JORGENSEN" Extra Quality

Series 820 Welders Heavy Frame Deep Throat with Crank or Bar Handle with or without Shielded Screw.

A large variety of others to choose from

Send for Catalog No. 16

Ask for Them by Name

ADJUSTABLE CLAMP CO.

"The Clamp Folks"

426 N. Ashland Ave., Chicago, (22), U. S. A.

HARGRAVE TESTED CLAMPS

INDIVIDUALLY TESTED

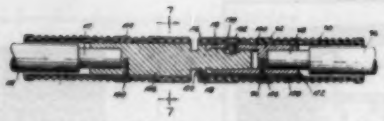
- WELDING
- DEEP REACH
- QUICK ACTING
- FORGED STEEL

Write for new catalog showing a clamp for every purpose.

Ask your supply house

The Cincinnati Tool Co.

1944 Waverly Ave. Cincinnati 12, O.



Cable Connector

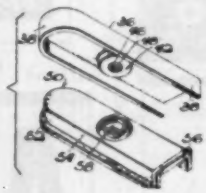
2,375,656. **Honel A. Jackson**, Detroit. Filed March 1, 1943. Issued May 8, 1945.

A cable connector consisting of a pair of separable sections. One section includes a member of conductive material provided with outside insulation, and the other section includes an outside covering of insulation material and an inside member of conductive material. One of these members is provided with a longitudinal conical bore, and the other with a longitudinal conical part of a size and shape to be tightly received within the bore. A cam on one of the members inclines longitudinally and away from the other member, which carries a means to overlap upon the cam when the conical part is tightly received in the bore. The last-mentioned part will also ride up the inclined fall of the cam when the two sections of the holder are rotated about their longitudinal axes, releasably securing the sections together.

» «

Electrode-Holder Insulation

2,375,657. **Honel A. Jackson**, Detroit. Filed June 16, 1943. Issued May 8, 1945.

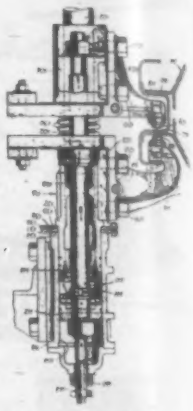


An insulating member for an electrode holder comprising a channel-shaped metal shell. A portion of the wall of the shell extends inwardly to provide an annular boss forming an opening in the shell; boss is so shaped that the wall of the opening tapers inwardly. Insulation material is juxtaposed substantially coextensively with inside of the channel of the shell; the insulation material is of a thickness somewhat greater than the depth of the boss and extends over the inside face of the boss and over the wall of the shell opening to form an opening to receive the enlarged head of a metal-fastening member and insulate the same from the metal of the boss.

» «

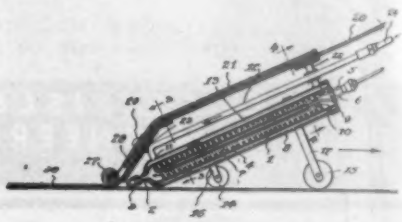
Welding Gun

2,372,413. **William A. Weightman**, Philadelphia, assigned to **Edward G. Budd Mfg. Co.**, Philadelphia. Filed Aug. 1, 1940. Issued March 27, 1945.



In a welding gun, a cylinder mounted on a support and two pistons. Two welding electrodes and two piston elements each connect one of the electrodes to one of the pistons; each piston element extends from the same end of the cylinder.

» «



Thermoplastics Welding Torch

2,372,737. **William M. Phillips, Jr.**, Detroit, assigned to **The Udylite Corp.**, Detroit. Filed April 16, 1943. Issued April 3, 1945.

A welding torch especially designed for butt welding two sheets of thermoplastic material together. The torch tip directs a hot gaseous blast against the adjacent surfaces as the torch is moved along the joint. Terminating adjacent to the tip is a means for guiding a filler strip into the gaseous blast and over the joint in order to weld the two sheets and strip of thermoplastic material together. The weld strip is pressed into welding relation with the sheets while the respective surfaces are at welding temperature.

» «

Electrode Holder

2,372,251. **Theodore K. Checkos**, Los Angeles. Filed Sept. 7, 1943. Issued March 27, 1945.

An electrode holder having a tubular handle of insulating material with an opening for a manipulating lever. A core is movable longitudinally within the handle, and a helical spring around the core normally urges a limited range of relative longitudinal movement between the handle and core. The lever, extending from the core, is fulcrumed upon an edge of the opening to manipulate the movement between the handle and core.

WE HAVE LARGE STOCKS OF WELDING SUPPLIES... *Call us* FOR QUICK SERVICE!

THE convenient location of our warehouses in the leading production centers enables us to give the best possible service on welding orders under today's difficult conditions. We have large stocks of the following types of Welding Wire for electric arc welding:

STAINLESS STEEL ELECTRODES
MILD CARBON STEEL ELECTRODES

ALSO available for speedy delivery are Welding Machines, Protect-O-Metal for the elimination of weld spatter and Havens "C" Protected Clamps. Phone, write or wire our warehouse nearest you—all orders and inquiries receive courteous attention and prompt action.

UNITED STATES STEEL SUPPLY COMPANY
CHICAGO (90) · BALTIMORE (3) · BOSTON (34)
CLEVELAND (14) · MILWAUKEE (1) · NEWARK (1), N. J.
PITTSBURGH (12) · ST. LOUIS (3) · TWIN CITY-*St. Paul* (4)

UNITED STATES STEEL

PALMGREN

CONNECTORS for **WELDING CABLE and TERMINALS**

3 SECONDS to Hookup—Lengthen · Shorten · Replace

They speed up production, save hours of time and end delays. Make short cables reach farther. Connect or disconnect instantly for shift to any job in shop or field. Used by America's Leading Industries.

Ideal For All Types Conductor Cable

Such as welding, supply lines, ships, electric cars, mining operations, etc. Standard opening fits 1-1/0-2/0-3/0-4/0 cable. Designed for positive locking and highest conductivity. Also types for panel, bus, angle and multiple hookups.

Write for Circular describing complete line, also price list

CHICAGO TOOL AND ENGINEERING CO.
Manufacturers of PALMGREN PRODUCTS for Over 25 Years
8407 SOUTH CHICAGO AVE. CHICAGO 17, ILLINOIS

For Better and Easier Welding

DUCTONE AC

(E6011 and E6013)

WELDING RODS

Prompt delivery can be made on DUCTONE AC rods, the electrode that has been designed especially for AC welding. This is a premium quality electrode that is far superior to all other AC rods. It is noted for its extra-stabilization in the coating, which makes striking and maintaining an arc easy, and for its all position use . . . Small sizes are especially good for thin sheet metal. Excellent for vertical and overhead welding on DC positive polarity. Extruded all sizes from 1/16" to 1/4" See your dealer.

Territories Available for Distributors

Reach for DUCTONE *AC Welding Rods*

Chicago Steel and Wire Co.
103rd St. and Torrence Ave.
Chicago 17, Illinois

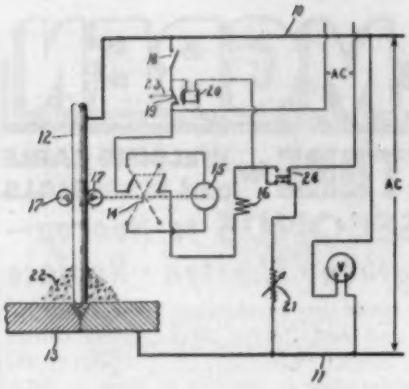
Fuse-Well Cast Welding Rods

The Standard of QUALITY THROUGHOUT THE WORLD

Cast Aluminum Welding Rods of Standard Analysis

Plain and alloyed Gray Iron Welding Rods and Electrodes

THE CHICAGO HARDWARE FOUNDRY CO.
Dependable Since 1897
ENGINEERING BUILDING
NORTH CHICAGO, ILLINOIS



Submerged-Melt Welding

2,371,894. **Harry E. Kennedy,** Berkeley, and **Maynard A. Rotermund,** Walnut Creek, Calif., assigned to **The Linde Air Products Co.** Filed July 31, 1943. Issued March 20, 1945.

In an automatic submerged-melt welding system, a welding electrode and a workpiece electrode are relatively movable; the welding electrode is fed toward the workpiece electrode as the former is consumed. A series motor connected across the electrodes is operatively associated with the feeding means.

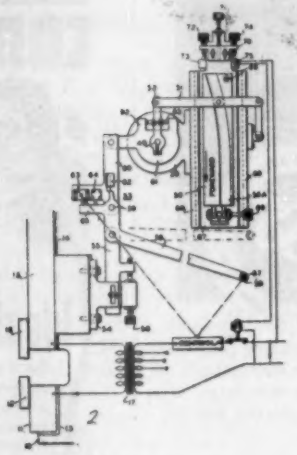
» «

Brazing Tongs

2,371,664. **Ernest Robert Workman,** Chicago. Filed July 16, 1943. Issued March 20, 1945.

A welding or brazing tool having a pair of terminals with welding tips. A compressible spring normally holds the terminals and their tips apart. A handle is rigidly attached to one terminal, and an operating member is pivotally connected to the other terminal, at a point intermediate its welding tip and the area on which the spring bears.

» «



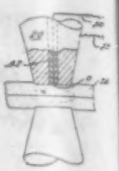
Flash-Weld Control

2,373,226. **Clyde E. Coates,** Warren, O., assigned to **The Taylor-Winfield Corp.,** Warren. Filed Feb. 18, 1942. Issued April 10, 1945.

Means to control the movement of the movable platen of a flash welder during the welding cycle. Elements are: a source of hydraulic fluid under pressure, a pressure-operated motor for moving the platen, and a follow-up valve for metering the flow of fluid to the motor. The latter valve has two movable elements, one of which is connected to the platen. The movement of the other valve element is controlled in such manner that the movement of the platen will follow a predetermined position-speed relationship during the flashing period of the cycle. A second valve, in parallel with the first, operates to conduct a relatively large volume of fluid to the motor; this valve is actuated after the termination of the flashing period.

» «

Spot-Welding Control



2,372,211. **Chester F. Leathers,** Detroit, assigned to **Progressive Welder Co.,** Detroit. Filed May 11, 1942. Issued March 27, 1945.

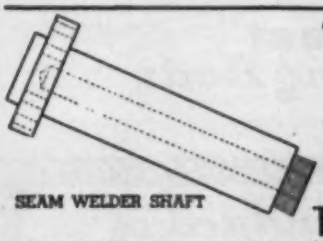
A device to control welding current in a spot welder in accordance with the temperature of the work. The temperature is measured at the surface of the work and within the area engaged by the electrode. A means responsible to the temperature measurement controls the current flow; the latter means includes a thermocouple, one element of which is constituted by the work and the other is carried by the electrode.

» «

Automatic Welding Head

2,372,261. **Alois P. Drda,** Medina, O assigned to **The Midland Steel Products Co.,** Cleveland. Filed July 16, 1941. Issued March 27, 1945.

This patent covers a movable elongated tube having radial gear teeth extending its full length and entire circumference. A spiral thread is cut into and across the gear teeth, and a split nut engages the thread. A drive spur gear meshes with the teeth for rotating the tube; spur gear is rotated in either direction by a reversible motor.



"ELECTROLOY" for RESISTANCE WELDING

Butt
Flash
Spot
Seam
Projection

ELECTROLOY

Catalog and Prices on Request

THE ELECTROLOY CO. INC. 1600 SEAVIEW AVE. BRIDGEPORT, CONN.

JOHN NAGELDINGER & SON, INC.

Manufacturers: OXYGEN THERAPY APPARATUS ☆ CYLINDER VALVES ☆ CYLINDER MANIFOLDS ☆ NEEDLE VALVE CONTROLS ☆ WELDING AND CUTTING EQUIPMENT ☆ PRESSURE REGULATING VALVES & REGULATORS ☆ SAFETY VALVES ☆ COMPRESSED GAS APPARATUS FOR: OXYGEN, HYDROGEN, NITROGEN, ACETYLENE, CARBON-DIOXIDE, HELIUM, ETC.

Send for 32-Page Catalog Featuring Welding and Cutting Equipment and Supplies.

Established 1880 FACTORY AND OFFICE AT **409 East 91st Street New York City 28, N. Y.** TELEPHONE: **Atwater 9-8843**

• Oxy-Acetylene Rods and Fluxes
• Welding & Cutting Torches
• Pressure Regulators
• Arc Welding Electrodes
• Helmets Goggles Lenses
• Welders' and Work Gloves

Special Welding Alloy Co., Inc., 27-33 Jackson Ave., Long Island City 1, N. Y.

GIRL OPERATOR Makes INTRICATE WELD SET-UP

Duplicate fixtures permit girl operator to make intricate set-up while welder tack welds assembly previously set up. All parts held firmly in accurate position with De-Sta-Co 110-C Clamps.

4 DE-STA-CO 110-C TOGGLE CLAMPS

enable a girl operator to quickly and accurately form an intricate set-up, held in secure position for the succeeding welding operation.

So many production and assembly operations are simplified by De-Sta-Co Toggle Clamps. And there are so many types and sizes that every purpose can be served.

DETROIT STAMPING CO.
Established 30 Years
334 Midland Ave • Detroit 3, Mich.

P&H WELDING POSITIONERS

WELD FASTER, EASIER, AT LOWER COST!

Model WP-2—2500 lbs. Capacity

There are more big time-and-money-saving advantages in this new P&H WP-2 Welding Positioner than you would believe possible — at such surprisingly low cost.

The WP-2 is the most versatile positioner in its class — easiest to operate. Of all-welded steel construction with large table area and hydraulic power tilting — it is available with manual, handwheel or power turning. Has positive table locking device — telescopic elevation.

Write for Free Bulletin

. . . of facts and pictures giving complete story! Start now to save time, costs by positioning your work. It shows you how! Ask for Bulletin P2-1.

General Offices: 4513 West National Ave., Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION
ARC WELDERS • EXCAVATORS • ELECTRIC CRANES P&H MOTORS • HOISTS • WELDING ELECTRODES

The Right Fluxes Are The Most Important Part of Your Metal-Joining Job

Krembs FLUXINE Fluxes are the answer. They are highly concentrated. That is why they are so economical to use and so effective, even though they cost a little bit more. They go four to five times further than any other competitive fluxes. They are all flux . . . no waste material added. They do not bubble, wriggle, blow or chip off the rods when heat is applied. They produce strong, non-porous joints . . . do not cake or deteriorate. They are the result of 70 years of experience.

You can get more and better brazing, silver soldering and welding from Krembs FLUXINE Fluxes. You will be surprised how far they go. Try them just once. You will see the difference immediately.

Ask your Jobber. If he handles our FLUXINE Fluxes, he has your best interests at heart. He knows the FLUXINE line produces the best results with the greatest economy.

Write for chart which shows the FLUXINE Fluxes to use for your metal-joining problems.

KREMBS & COMPANY
Est. 1875
Dept. G, 669 W. Ohio St. • Chicago 10, Ill.

FLUXINE
TRADE MARK REGISTERED U. S. PAT. OFF.

FREE

ENGINEERING INFORMATION for **BETTER WELDING**

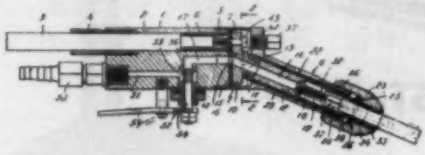
This new Engineering Bulletin contains important technical information that may save you time, labor and money on many welding jobs. Learn how to keep welding jigs free of spatter; how to save mill-scale cleaning time after normalizing; how to reduce fumes; etc., etc. Contains actual case histories and laboratory authenticated reports. Write for your copy now.

The MIDLAND PAINT & VARNISH CO.
9110 RENO AVENUE CLEVELAND 5, OHIO

Cutting-Electrode Holder

2,371,945. **Peter Barbeck,** New York City, assigned to **Oxygen Arc Equipment Co., Inc.,** New York City. Filed Aug. 5, 1943. Issued March 20, 1945.

A holder for the hollow electrodes



used in arc-oxygen cutting. Patent includes a means for supplying gas and electricity to the interior of the body portion and the electrode-engaging member, means for removably attaching a hollow electrode, means for maintaining an electrical connection, electrical insulation interposed between the connecting means, body portion and electrode-engaging means, and an elastic rubber member in operative engagement with the electrode-engaging member to prevent the escape of gas.

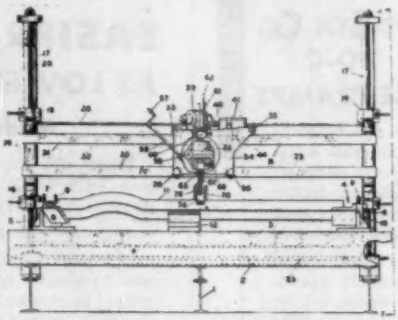
» «

Seam-Welding Feed

2,372,893. **Howard P. Guirl,** Munster, Ind., assigned to **The Superheater Co.,** New York City. Filed Feb. 11, 1943. Issued April 3, 1945.

Means for simultaneously feeding a metal base member and a metal strip of relatively thin cross-section past the welding station of a seam welder. A welding electrode at the station contacts the strip to press it against the base. A wedge of non-conductive material is located in advance of the welding station. The wedge initially interposes its thickest portion between the strip and base and presents portions of progressively decreasing thickness between the parts as they pass the welding station.

» «



Flame-Hardening Apparatus

2,372,298. **William E. Smith,** Detroit, assigned to **The Midland Steel Products Co.,** Cleveland. Filed March 14, 1941. Issued March 27, 1945.

An automatic flame-hardening apparatus comprising a track, a carriage, a torch carrier mounted on a horizontal axis and an adjustable torch suspension member adapted to be guided by the contour of the work. The torch head is mounted upon the suspension member on a horizontal axis to adapt itself to vertical variations and varying angles of the surfaces of the work being treated.

» «

Electrode Holder

2,371,649. **John M. Radabaugh,** Mount Vernon, O. Filed June 22, 1943. Issued March 20, 1945.

An electrode holder with a handle carrying coacting resilient jaws operatively connected with a source of electric current. A member extending between the jaws engages at one end a slidable means for adjusting one jaw toward and away from the mating jaw.

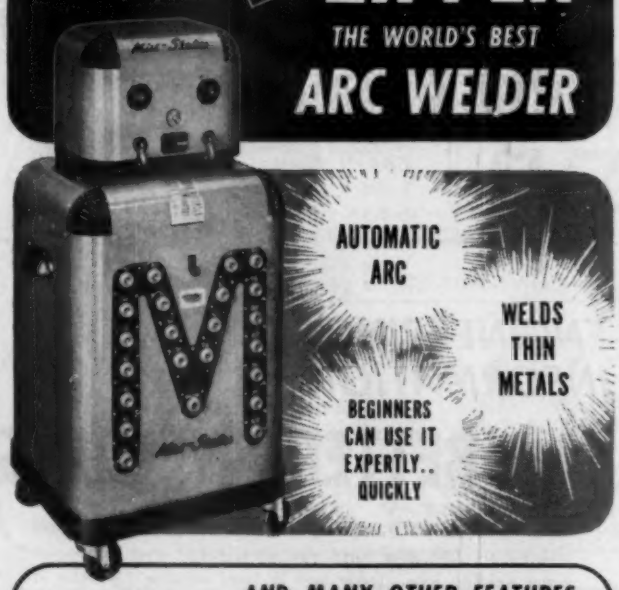
» «

Wiping Solder Alloys

2,372,745. **Albert A. Smith, Jr.,** Metuchen, N. J. asigned to **American Smelting and Refining Co.,** New York City. Filed July 17, 1942. Issued April 3, 1945.

An alloy soldering composition of relatively low melting point. The constituents approximate from 5 to 40% tin, 0.5 to 5% silver, 0.5 to 3% antimony, the balance being substantially all lead.

Mid-States METAL ZIPPER
THE WORLD'S BEST
ARC WELDER



..... AND MANY OTHER FEATURES
NOT FOUND IN ANY OTHER TYPE OF WELDER
Sold by Leading Jobbers Everywhere
WRITE FOR NEW FREE BULLETIN JUST OFF THE PRESS
Mid-States EQUIPMENT CORP.
2431 South Michigan Avenue Chicago 16, Illinois

SILVER BRAZING ALLOYS
RINGS and WASHERS for all brazing jobs
ANY QUANTITY
ANY SHAPE—ANY SIZE
Also Strip, Coiled Wire, and Filings.
Available in standard alloys covered by Federal Government, Army, Navy, Air Corps and A.S.T.M. specifications.
For your post war products—investigate our special alloys described in booklet M-A sent on request.
Your inquiries invited
PRECIOUS METALS APW SINCE 1875
A.P.W. FLUX PASTES
Safe and convenient. Excellent cleaning action.
THE AMERICAN PLATINUM WORKS
N. J. R. R. AVE. AT OLIVER ST. NEWARK 5, N. J.